



SATURDAY, JUNE 3, 1871.

AN IMPROVED TRACK-GAUGE.

In the construction of rolling stock, the distance between the flanges of the wheels is adjusted enough less than the true gauge to give room for the lateral motion, which is indispensable—or so considered, at least—at all points, and particularly in passing about curves; but if, at various points, the distance between the rails is materially greater than the true gauge, there ensues a frightful oscillation of engine and cars at high speeds. The wheel flanges are thrown violently against the rails, causing serious and unnecessary wear to the track, and great liability of accident to trains.

There are few American railroads upon which the position of the rails will not vary from one-half to three-fourths of an inch from the true gauge. While the "line side" of the track may be perfectly true, the "gauge side," it will be observed, is variable or "snaky," and the wheel flanges are as liable to press against and follow the crooked side as the straight one.

This inferior condition of the permanent way is secured at no diminution of first cost to the railroad company. It results alone from an improper use of the material furnished. In laying the iron, the implement known as the "track-gauge" is often handled by careless persons, who do not take sufficient pains to place it at right angles to the rail, and a considerable variation of the gauge is the result. Indeed, it is difficult for careful and experienced men, with the implement ordinarily used, to adjust the gauge accurately on sharp curves, and among frogs and switches, where the eye is liable to be misled by surrounding objects. With an ordinary track-gauge, which does not adjust itself perpendicularly to the rail, the workman has no other guide than his "eye," unless he adopts the very common rule of placing the gauge at the rail-joint on both sides of the track. But on a curve, as is well known, the rails on the inner side will "run ahead," in laying track, rendering it necessary to frequently cut the inner rail to keep it in its proper position. It is not uncommon for the inner rail to run ahead fifteen or twenty inches, so that where this rule is followed the gauge is materially narrowed, and at a point, too, where such a variation is most dangerous. At the points of frogs it is very essential to get a correct gauge, but it is sometimes difficult to secure it, for the reasons mentioned.

The body, *A*, of the track-gauge shown in the accompanying engraving, is made of wood, with metal plates, *B*, and *C*, bolted to its ends. The plate, *B*, is forked, with shoulders projecting downward from near the ends of the prongs. These shoulders bear against the sides of the rail, so that with very little care the gauge may be set perpendicular to the "line side" of the track. The plate, *C*, bolted to the opposite end of the wooden stock, has a projection, *d*, extending downward below the stock, so that the gauge may be used at guard-rails and frogs.

The cost of the gauge is but little in advance of one of the ordinary form, and it will be found worthy the attention of managers of railroads in course of construction. It is believed that its use by repair-men on old railroads, will gradually improve the condition of the track. Mr. A. N. Kellogg, at Nos. 110 and 112 Madison street, Chicago, will give any further information concerning it.

—The following is the statement of iron manufacture in 1870, in the city of Cleveland:

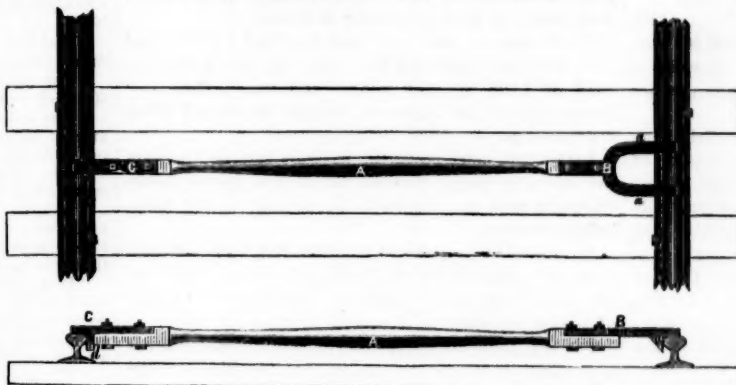
	Tons.
Pig iron	18,575
Rails, iron	39,367
Rails, steel	33,000
Rails, steel-capped	3,056
Merchant iron	17,955
Boiler, tank and sheet iron	4,250
Forgings	5,775
Nuts, washers, bolts, nails, spikes	10,751
Machinery castings	27,900
Wire, iron and steel	2,160

The consumption during the year of coke and scrap iron was 125,800 tons, and of coal and pig, 372,500 tons. No new mills have been started, but most of those in existence have been extending their capacity.

ELLIOT'S RAILROAD CROSSING.

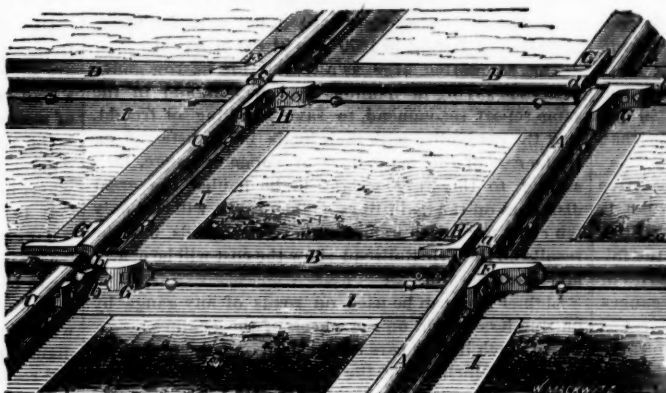
The engraving represents a railway crossing in extensive use on the Ohio & Mississippi, North Wisconsin, and St. Louis & Southeastern, and many other lines of road.

The distinctive feature of this crossing is, that it consists wholly of long rails, no short sections being used, and, as a consequence, no metallic foundation plate is required. The crossing has four rails, *A A*, *B B*, *C C*, and *D D*, (that may be full rail length) each of which runs through one side of the crossing track, and abuts against the other side of the same. Thus the rail *A A* runs past the end of the rail *B B*, and abuts against that of *D D*; *a, b, c, d* are notches in the tops of the rails to receive the flanges of wheels running upon the cross-track. Cast-iron knees, *F G H*, are applied to the obtuse corners, at the point of intersection,



Huntington & Kellogg's Improved Track-Gauge.

and bolted through the rails. The tops of the knees, *G, H*, are so formed as to constitute the "guard-rails," and no others are required. *I I* are sill timbers, halved together at the intersections and underlying the rails, which are attached to the sills by ordinary spikes. This crossing can be laid very quickly, requiring but a



Elliot's Railroad Crossing.

light force of hands, and any part admits of easy removal and renewal without the least disturbance of the other parts. It is believed by many to be the most economical and satisfactory crossing now in use.

The crossing was patented Oct. 15, 1867, and is manufactured and put down in all parts of the United States and Canada by the "St. Louis Railway Supplies Manufacturing Company," by whom information and estimates will be furnished.

Indiana North & South.

This is to be the great coal road of Indiana, extending from Newburg, on the Ohio River, eight miles east of Evansville, northward through the Brazil coal fields, and with connections thence to Chicago. The general contract for the construction of the line has been let to Chamberlain & Matthews, of Ohio, and contracts have been let for the immediate construction of 22 miles, from Brazil northward through Rockville, and of 14 miles, from Chambersburg, on the Indianapolis, Bloomington & Western road, northward to Attica, on the Toledo, Wabash & Western, to Dewey & Mitchell, of Indianapolis, who are at work grading. Work is also progressing on 14 miles of the road from the Ohio River northward.

This road will extend through the block coal fields in the direction of their greatest length.

Chicago, Pekin & Southwestern.

The Eureka Journal learns that work is to be resumed along this line from Pekin to Marseilles, Ill., under the supervision of Col. Plumb, of Streator, to whom the contract has been let.

Contributions.

GAUGE, GRADE AND THE ECONOMY OF BUILDING AND OPERATING RAILROADS.

[The following paper was prepared by the author, who is now Chief Engineer of the St. Louis and Southeastern Railway Company, for the consideration of certain capitalists in Missouri, who were considering the propriety of constructing a narrow gauge railroad.]

Mr. Fairlie, the great advocate of narrow-gauge railways, says:

"Every inch added to the width of a gauge, beyond what is absolutely necessary for the traffic, increases the proportion of dead weight, increases the cost and danger of working, and, in consequence, increases the tariffs to the public, and reduces the useful effect of railways."

"The cost of construction of railways varies as the width of gauge."

"A road of 3-foot gauge is infinitely less costly than a road of 4 feet 8½-inch gauge; much sharper curves and grades, lighter iron and cars can be used; its capabilities in respect to power and speed are equal to the wants of the country; and it is infinitely superior in every respect."

The proportion of non-paying to paying weights on roads of 4-feet, 8½-inch gauge in passenger trains is as much as 29 to 1, and in goods trains, exclusive of minerals, as much as 7 to 1; this, in a great degree, is owing to the gauge.

"The dead weight of trains conveying either passengers or goods is in direct proportion to the gauge on which they are run."

"On the London & Northwestern Railway the non-paying weight to the paying weight is about seven tons to one ton; or, it takes 70 million tons of rolling weight to carry 10 million tons of paying load, and the management is so good its shortcomings must be wholly due to its construction."

"Assuming 40 million tons of rolling weight to carry 10 million tons, if its gauge was 3 feet instead of 4 feet 8½ inches, its goods traffic could be hauled at half the present cost, or with half the present motive power, and in such a way as to reduce the present tonnage over the road by one-half, and remove the necessity for the heavy expense that is now being incurred in the construction of a third line of rails."

"The wagons employed on the London & Northwestern Railway weigh four tons; hence actually carry only an average of four-sevenths of a ton each."

"The best wagons can carry on the ordinary English roads nearly twice their own weight."

"Wagons on 3-foot gauge weigh one ton and can carry three tons."

"Assuming the same number of trains and wagons run on each gauge, and that each wagon carries one ton, then the gross load for one year on the 3-foot gauge would be 20,000,000 tons, instead of 50,000,000, and the same amount of paying weight."

"If there should be sufficient traffic to load the narrow-gauge wagons in such a way as to require the same number and weight of trains that are now worked, the result would be that, without increasing cost, the 3-foot gauge would carry a paying load of 25,000,000 out of 50,000,000 tons gross load, against the 10,000,000 tons now carried; hence, then, we have the established fact that, so far as capacity goes, the narrow-gauge is superior to the broad-gauge."

"A 2-foot 6-inch gauge is ample for any traffic in temperate climates, and will sustain a speed of thirty miles per hour."

"A 3-foot gauge is sufficient for any traffic in hot or cold climates, and will sustain a speed of forty miles per hour."

"The narrow-gauge railways will only cost a little over half as much as the 4-foot 8½-inch-gauge railways, and are capable of carrying as many passengers and tons of goods as the best lines now existing."

All of the statements with reference to the London & Northwestern Railway, by which Mr. Fairlie thinks he has shown that the carrying capacity of a road of 3-foot gauge is 2½ times greater, at same cost, than that of a 4-foot 8-inch gauge, only show that the management is not good.

If the carrying capacity, at same cost, is 2½ times greater on a 3-foot gauge than on a 4-foot 8½-inch gauge, then the carrying capacity, at same cost, of a 4-foot 8½-inch gauge, must be at least two times greater than on a 6-foot gauge.

The Pennsylvania Central Railroad is 355 miles in length; it has 353½ miles of double track, 29 miles of third track, 144 miles of sidings, and 323½ miles of branches, including sidings. Total number of miles operated, including double track, sidings and branches, 1,205. Its gauge is 4 feet 8½ inches, and it is worked to nearly its full capacity.

The Erie Railway has a gauge of 6 feet, and is 459 miles in length; the length of double track, including sidings, is 381 miles; the length of branches is 364

miles, and double track $50\frac{1}{2}$ miles. Total number of miles operated, including double track and sidings, is 1,255.

The grades, curves and character of the two roads are similar.

The total number of passengers carried on the Pennsylvania Central Railroad, in the years 1868 and 1869, was 7,975,541. The number of passengers carried one mile was 277,903,358. The average charge per passenger, per mile, was 2 61-100 cents.

The total number of tons of freight carried in 1868 and 1869 was 8,103,074, of which 4,394,407 were of coal. The total tons moved one mile was 1,428,486,872. The average charge per net ton, per mile, was 1 8-100 cents.

The total number of passengers carried on the Erie Railway in the years 1868 and 1869 was 4,691,461. The number carried one mile was 252,768,042. The average charge per passenger, per mile, was 2 44-100 cents.

The total number of tons of freight carried in 1868 and 1869 was 8,220,452, of which less than 3,000,000 tons were of coal. The total number of tons moved one mile was 1,413,528,415. The average charge per net ton, per mile, was 1 68-100 cents.

The Pennsylvania Central Railroad is certainly as well managed as the Erie Railway, and the results of operating these two roads for a number of years, allowing for a difference in charge for transportation, will show approximately what effect gauge has on the cost of operating.

The gross earnings of the Pennsylvania Central Railroad in 1865, 1866, 1868 and 1869, were \$68,527,359, and the operating expenses, including taxes, were \$50,125,317, or 73 $\frac{1}{2}$ per cent. If the gross earnings of the Erie Railway for 1865, 1866, 1868, and 1869 were \$68,527,359, then, according to Fairlie, the operating expenses would have been over \$100,000,000, with the same management as on the London & Northwestern Railway, assuming 4 tons instead of 7 tons non-paying load to 1 ton of paying load.

The actual gross earnings of the Erie Railway during the four years were \$62,157,012, and the operating expenses, including taxes, were \$47,964,318, or 77 $\frac{1}{2}$ per cent.

If the same prices for transportation had been charged on the Erie Railway that were charged on the Pennsylvania Central Railroad, the earnings during these four years would have been about \$4,500,000 more, and the operating expenses would have been only 70 per cent. of the gross earnings, or 3 $\frac{1}{2}$ per cent. less than the operating expenses of the narrow-gauge.

This probably does not show the exact comparative cost of working the narrow and wide gauges, but it does show that the difference can be but very little; and it will be seen by a careful examination of the following table of the earnings and operating expenses of some of the principal roads of narrow and wide gauges in the United States, that it is approximately correct.

The main reasons why the net earnings of roads are so small are because the business is largely through business, done for small profit, and at high speed. If the business was all local and done at present local prices, and at low speed, the net earnings would be very large compared with the gross earnings.

minimum of the two gauges being practically as one to three."

This cannot be correct, for curves of less than 300 feet radius have been used without difficulty on roads of six-foot gauge. On the Baltimore & Ohio Railroad there are many curves of 400 feet radius and one of 318 feet radius, which trains pass over at a speed of 20 miles per hour without difficulty. Curves of 50 feet radius on a 4-foot 8 $\frac{1}{2}$ -inch gauge road are said to be traversed at a speed of 30 miles per hour with a 27-ton Fairlie engine.

On the Festiniog Railway, gauge 1 foot 11 $\frac{1}{2}$ inches, the sharpest curve has a radius of 132 feet, and the maximum grade is 70 feet rise per mile.

If the engines are properly constructed, very sharp curves can be used on roads of common gauge, but straight roads of any gauge are preferable, more, however, on account of safety in operating, and saving in wear and tear, than the saving in power.

It will require the same power to haul a given load over a straight road of 3-foot gauge as over a straight road of 4-foot 8 $\frac{1}{2}$ -inch gauge, and nearly the same power over similar curves on roads of 3-foot and 4-foot 8 $\frac{1}{2}$ -inch gauge, grades being the same.

Larger and more powerful engines can be used on the common gauge than on the narrow gauge, hence steeper grades may be used, the capacity of the roads being the same.

Mr. Latrobe's experiments on the Baltimore & Ohio Railroad, gauge 4 feet 8 $\frac{1}{2}$ inches, show that each degree of curvature per 100 feet is equivalent to 1 $\frac{1}{4}$ feet of ascent per mile.

The resistance on curves on roads of different gauges is proportional to the difference of the respective radii of the curves.

"The cost of hauling a ton of goods over a narrow-gauge road may be safely reckoned at less than one-half the cost of hauling the same goods over the common gauge."

"The cost of transportation of merchandise, on the Cologne & Giessen Railway of 2-feet 7-inch gauge is about 1 $\frac{1}{2}$ cents per ton, per mile."

On the Pennsylvania Central Railroad, 4-foot, 8 $\frac{1}{2}$ -inch gauge, the average cost per net ton, per mile, for transportation of freight in 1870 was 91-100 of a cent.

The committee urge as a reason for narrow-gauge roads the saving in hauling dead weight, and in the same report recommend, to save handling of freight, that the car bodies with their loads be transferred on to the cars of the main lines of common gauge, thus adding to the dead weight to be hauled the great distances on the main lines. They say it will cost only ten cents per ton to unload and reload goods, but the results on the Erie Railroad show the cost will be nearer fifty cents per ton.

Lighter iron can be used on roads of any gauge by putting less weight on the wheels of the engines.

Not much lighter cars can be used on a 3-foot than on a 4-foot 8 $\frac{1}{2}$ -inch gauge, the capacity being the same.

The difference in weight between cars of equal strength capable of carrying 12 tons, of 4-foot 8 $\frac{1}{2}$ -inch gauge and of 3-foot gauge, due to difference of gauge, is about 500 lbs., the only saving in weight being in the

\$2.50 to \$3.10; ordinary labor, \$1.50 to \$1.75. Average cost per mile, \$32,000.

"2d. The railways from Connyveram to Arconnur, India. Length, 19 miles; gauge, 3-feet 6-inches. (Land and portion of road-bed given by government). Materials chiefly sent out from England. Rails, 35 $\frac{1}{2}$ lbs. Average cost per mile, \$19,000.

"3d. The Toronto, Grey & Bruce, and the Toronto & Nipissing railways, Canada. Length of first section 193 miles; gauge, 3 feet 6 inches. Wages, ordinary laborer, \$1 to \$1.50. Average cost per mile, \$24,150.

"The maximum grade is 106 feet, and the sharpest curve 480 feet radius on a 105-foot grade. The cost of grading was comparatively small, which was obtained by making the road follow the natural contour of the surface. The engines used on the road weigh from ten to twenty tons and will draw a load of 100 tons besides the cars.

"The passenger cars are thirty feet long and will seat thirty-seven passengers—the seats being double, as on standard roads, and having a twenty-four inch passage way between them. The platform cars are thirty feet long, weigh 10,500 pounds, with a capacity of ten tons.

"The box cars are 15 feet long and weigh 3 $\frac{1}{4}$ tons. Stock cars carry ten head.

"The engines cost \$8,000 each; passenger cars, \$1,600 each; platform, \$500; and box \$400.

"The road-bed cost less than \$5,000 per mile. The annual expenses of the road are between fifty and sixty per cent. of the receipts.

"4th. The government railways, Norway, (constructed by Capt. Pihl, C. E.)

"Length, 106 miles; gauge 3 feet 6 inches. (Rails and many other materials sent out from England.) First, through easy country, \$15,900 per mile; second, through heavy country, \$23,700 to \$26,150 per mile.

"It is possible to construct a thoroughly substantial track with rails not weighing more than from 30 to 40 pounds per linear yard, provided that the ties are laid sufficiently close, the rails well fished at the joints, and an ample supply of ballast provided.

"The speed of 25 miles an hour is found in practice to be more than sufficient for tributary roads.

"A load of four tons per wheel is sufficient to enable the passenger and freight cars to be of ample dimensions for convenience of traffic. The passenger cars of latest design are of the usual American type, 32 feet long, exclusive of platforms, and 3 feet 6 inches wide, carrying very comfortably 32 passengers.

"The box cars are 14 feet long and 8 feet 6 inches wide. The platform cars are 24 feet long and 8 feet 6 inches wide, and carry 10 tons, their own weight being only 5 $\frac{1}{4}$ tons."

One of the claims for narrow gauge is that lighter iron can be used; that 30 to 40 pounds per linear yard are sufficient on a 3-foot 6-inch gauge, when it requires a load of four tons per wheel in order to make the cars of ample dimensions for convenience of traffic.

On American railroads of 4-foot 8 $\frac{1}{2}$ -inch and 6-foot gauges, not to exceed 2 $\frac{1}{2}$ to 3 tons are put on each wheel of the cars.

It is asserted by Mr. Fairlie "that there is more danger in working a 4-foot 8 $\frac{1}{2}$ -inch gauge than a narrower gauge, and that a speed of 40 miles an hour can be made with ease and safety on a 3-foot gauge."

In order to preserve the stability of the cars the wheels on a 3-foot gauge cannot be over 20 inches in diameter, and a speed of 40 miles an hour will require 672 revolutions per minute.

The wheels on a 4-foot 8 $\frac{1}{2}$ -inch gauge are 33 inches in diameter, and at a speed of 40 miles per hour will make 407 revolutions a minute, giving a difference of 265 revolutions.

With lighter cars, three-fifths the base, and wheels which to obtain the same speed make 1 7-10 revolutions to one revolution of the wheels on the 4-foot 8 $\frac{1}{2}$ -inch gauge, it is difficult to understand how a 3-foot gauge can be worked more safely than a 4-foot 8 $\frac{1}{2}$ -inch gauge, or that it is safe to run 40 miles per hour on a 3-foot gauge road which has steep grades and very sharp curves.

The saving in cost of grading, masonry and bridging of roads, averaging, say, 20,000 cubic yards per mile, will not exceed, for each foot the gauge is reduced, 1-25; saving in ties, 1-16; saving in right of way, 1-100; and saving in iron, rolling stock and fixtures to do the same amount of business, nothing.

The passenger cars for the 3-foot 6-inch gauge are 1 $\frac{1}{2}$ feet narrower than on the 4-foot 8 $\frac{1}{2}$ -inch gauge, and cannot be comfortable for two passengers on each seat as arranged.

The flat and box cars are about the same width as used on the 4-foot 8 $\frac{1}{2}$ -inch gauge, and, as I have shown, they must be comparatively of the same weight if of equal strength.

Mr. Fairlie admits that the best wagons on the English roads can carry nearly twice their own weight, and that on a 3-foot gauge they can only carry three times their own weight, yet, in comparing cost and results, he assumes the worst possible management and heavy cars, going only about one-eighth loaded, on the 4-foot 8 $\frac{1}{2}$ -inch gauge, and very small, light cars, carrying the same load per car, on the 3-foot gauge, and says this difference is due to gauge, when it is due to bad management and unsuita-

EARNINGS AND OPERATING EXPENSES OF SOME OF THE PRINCIPAL RAILROADS.

NAME OF ROAD	Gauge of road.	Miles operated.	Earnings.	Expenses exclusive of taxes.	Per cent.	Expenses including taxes.	Per cent.	Year ending.
New York Central.....	4 ft. 8 $\frac{1}{2}$ in.	557	\$13,975,594	10,888,368	77.9	11,230,810	80.3	September 30, 1865.
New York Central.....	4 8 $\frac{1}{2}$	594	14,596,785	11,013,441	75.5	11,395,678	77.7	" " 1866.
New York Central.....	4 8 $\frac{1}{2}$		96,447,453			76,243,772	78.7	1857 to 1866 inclusive.
New York Central.....	4 8 $\frac{1}{2}$	594	15,536,616			9,323,906	59.2	September 30, 1869.
Louisville & Frankfort.....	5	65	389,171			280,298	72.0	June 30, 1866.
Philadelphia & Reading.....	4 8 $\frac{1}{2}$	526	10,362,819			6,738,747	61.8	November 30, 1866.
Cleveland, Columbus & Cincinnati.....	4 10	138	2,386,132			1,550,612	74.9	December 31, 1865.
Bellefontaine.....	4 10	202	1,675,95	1,189,387	70.6	1,274,235	76.1	" " "
Pittsburgh, Fort Wayne & Chicago.....	4 8 $\frac{1}{2}$	423	7,467,317			5,117,636	68.9	" " "
Michigan Central.....	4 8 $\frac{1}{2}$	324	4,446,490			2,808,376	63.2	May 31, 1866.
Atlantic & Great Western.....	6	507	4,833,490	3,394,374	68.8	3,523,460	72.8	October 31, 1866.
Ohio & Mississippi.....	6	340	3,793,005			2,772,897	73.1	December 31, 1865.
Pennsylvania Central.....	4 9	559	17,491,169			13,270,058	76.0	" " "
Pennsylvania Central.....	4 9	559	16,583,862			12,790,909	77.1	" " 1866.
Erie.....	4 9	459	23,530,290			18,033,374	55.3	1847 to 1859.
Pennsylvania Central.....	4 9	640	34,484,308			24,064,250	69.8	1863 and 1869.
Erie.....	6	770	16,463,237	10,368,264	63.0	11,754,031	72.0	December 31, 1865.
Erie.....	6	770	14,596,413			10,853,140	74.3	" " 1866.
Erie.....	6	1,255	31,098,32			25,356,248	81.5	1868 and 1869.
Erie.....	6	1,255	62,177,012			47,964,318	77 $\frac{1}{2}$	1865, 1866, 1868 & 1869.
Pennsylvania Central.....	4 9	1,205	68,527,359			50,125,317	73 $\frac{1}{2}$	" " "

The following are extracts from the report on narrow-gauge railroads of the Joint Committee of the House of Representatives of Massachusetts, March 11, 1871:

"The difference in cost of the narrow and common-gauge railroads is nearly one to two, without reducing necessary efficiency."

This we will show cannot be correct, and that the capacity of a road is reduced much faster than the cost.

"The narrow gauge permits the use of curves entirely impracticable for roads of common gauge, the

axles and cross beams of trucks; the difference in weight of cars capable of carrying 3 tons will be about 125 lbs.; hence, when the amount of accommodation and the strength to sustain weight and resist hauling and buffing strains are the same, the proportion of dead weight to paying load is almost independent of gauge.

The following extracts from reports in regard to roads of 3-foot 6-inch gauge show that the cost per mile far exceeds the calculations of the narrow-gauge advocates, and to this cost, for roads in the United States, must be added the duties on iron and price of gold.

"1st. The Queensland railways, Australia. Length, 222 miles; gauge, 3 feet 6 inches. Wages—skilled labor,

ble rolling stock; and it only shows that there is great need of reform in rolling stock and management on the London & Northwestern road which carries 7 tons of train weight to one ton of goods.

By referring to the following table, compiled by W. Milnor Roberts, a distinguished engineer, of the ordinary working service of locomotives in the United States, it will be seen that in 1856 the average train weight on these roads, exclusive of engines, was less than the goods load:

Table of the ordinary working services of locomotives on certain railroads previous to 1856, showing the grades, curves, weight of engines, cars and load; giving, also, some of the maximum performances:

NAMES OF ROADS AND SUPERINTENDENTS.	Maximum grade.	Minimum radius of curvature.	Weight of engine in tons.	Number of single cars hauled.	Number of double cars hauled.	Weight of one car in tons.	Total weight of cars in tons.	Total weight of loading in tons.	Aggregate weight of cars and load in tons.	REMARKS.
Blossburg Railroad.....	39.6	600	25	50	25	2.85	142.5	142.5	142.5	Up grades.
J. S. Redfield, Superintendent..	39.6	600	25			6.50	162.5	162.5	162.5	Down "
Buffalo, Corning & N. Y. R. R.	46	1,000	25		25	7	105	150	255	Up "
Philadelphia & Columbia Railroad.....	44	1,500	26		20	8	160	150	310	" " maximum.
J. B. Baker, Superintendent....	44	1,500	26		22½	8	180	175	355	Good rail "
Pennsylvania Railroad.....	21	1,000	30	60		4	240	240	480	Up grades.
H. J. Lombaert, Superintendent.	21	1,000	27	50		4	200	200	400	5-loaded, 31 empty.
Reading Railroad.....	95	716	30		12	8	96	96	192	Ordinary.
G. A. Nichols, Eng'r and Sup't.	82.8	855	30		17	8	136	136	272	Maximum.
Cleveland, Columbus & Cincinnati Railroad.....	18	2,500	22.5		16	7	112	144	256	Ordinary.
A. Stone, Superintendent.....	40	1,500	22.5		23	7	161	207	368	Extraordinary.
Little Miami Railroad.....	40	1,500	22.5		37	7	259	351.5	610½	Ordinary.
W. H. Clement, Superintendent.	45	1,100	25		30	7	210	300	510	Maximum.
Bellefontaine & Indianapolis R. R.	39.6	1,433	22½		25	7	175	200	375	Ordinary.
J. Nottingham, Superintendent.	39.6	1,433	22½		25	7	175	200	375	Maximum.
Cleveland & Pittsburgh Railroad.....	50	1,000	31		18	7	126	162	288	Full performance.
J. Durand, Superintendent.....	44	1,500	31		22	7	154	198	352	Max'm "
Alleghany Valley Railroad.....	36.4	1,433	30		28	7	196	252	448	Full "
A. J. Hopper, Superintendent..	36.4	1,433	30		24	8	192	240	432	Ordinary.
				92½			6,881	7,330		Maximum.

Or, 1 6-100 tons non-paying load, including engine, to one ton of paying load.

* The "Atlantic" May, 1845; built by Norris; 90 miles, over 49 miles of levels, stopping and standing at will.

† And two empty locomotives.

Comparing the useful load, the weight of the cars carrying the useful load, and the weight of the empty return cars with the total movement on the Erie road for the year ending September 30th, 1855, the per centage was nearly as follows:

DIRECTION.	Weight of useful load.	Weight of cars containing load.	Weight of empty return cars.	Total weight.
Eastward.....	37.5	26.0	0.3	63.8
Westward.....	10.9	11.3	14.0	36.2
Totals.....	48.4	37.3	14.3	100.0

Or one ton of goods load to 1 6-100 tons of train weight, exclusive of engines.

Heavier engines are used now than in 1855, and heavier trains are hauled on all the main lines, on account of the great increase of business; and to stand the unavoidable pounding and jamming in hauling large, heavy trains, it has been deemed necessary by railway superintendents to increase the strength and hence the weight of cars.

I have no actual record of the percentage of useful load and train weight of the present workings of any of the above mentioned roads, but, from observation, I am satisfied that the average useful load is at least one and one-fourth tons of train weight, and the average useful load and train weight may be, and probably are, much nearer equal.

Freight cars used on railroads in the United States weigh from 8 to 10 tons each; the cars used on the London & Northwestern Railway weigh 4 tons each.

The receipts, working expenses, tonnage, etc., of the Philadelphia & Reading Railroad, in the years ending November 30, 1850 to 1869, were: coal, 47,504,464 tons; merchandise, 9,884,219 tons; gross receipts, \$106,969,548; total expenses, \$55,048,279, equal to 51½ per cent. of the gross earnings.

In the year 1869 the total length of the single track, main line and branches, was 1,142 miles; average weight of through loaded coal trains down, exclusive of engine and tender, 714.1 tons; average weight of through empty coal trains up, 270.7 tons; average weight of coal per train down, 523.4 tons; average weight of train, including return trains empty, 541.4 tons.

A road and the rolling stock of a 3-foot gauge can be built much cheaper than a road and rolling stock of a 4-foot 8½-inch gauge, provided it is reduced in strength

in all its parts proportionally to the gauge; but the capacity of such a road will be reduced much faster than the reduction in cost, as the saving in grading, masonry, right of way, etc., will be very small, the chief saving being in the iron, bridge superstructure and rolling stock; but we can also make nearly the same saving on a gauge of 4 feet 8½ inches by reducing the strength and capacity of rolling stock and road the same.

A short road of 3-foot gauge, light iron and light rolling stock, may have sufficient capacity, and answer all demands, if there is only a small and limited traffic of freight and passengers, and if speed is not required; and such a road may pay well, and answer as well as

freight, as on a less width of cars many kinds of freight could not be transported.

Again, it would not be practicable, or even economical, to have one gauge for passengers and one for freight, if a narrow gauge would do for freight.

Uniformity of gauge is necessary to the economical transportation of freight, to save unnecessary loading and unloading of freight, to save time, and that there may be a free interchange of cars. This is of as much importance to the short connecting lines as to the main lines; for, while it is not advisable to permit the cars of short line roads to run over other roads, it is of great advantage for the short roads to have the use of the cars of the main lines.

D. C. McCallum, General Superintendent of the Erie road in 1855, says, in his report, that the actual cost of loading and unloading 592,055 tons of freight on that road in 1855 was 34½ cents per ton.

To this must be added increased price of labor, cost of agents, clerks, stationery and storage, and for detention of freight and cars, which of itself must be a large item.

Hence it is evident that a difference in "gauge of roads increases the tariffs to the public and reduces the useful effect of railways."

Again, the short road of to-day may become a part of a trunk line to-morrow.

There can be no question that a great reduction can be made in building and equipping roads, and in cost of operating them, if the engines, cars, iron and superstructure are adapted to the requirements of the business.

The grades and curves should be made as light as consistent with true economy in building, to admit of light engines, light trains, light iron and superstructure.

It is evident that if a locomotive which weighs 30 tons is used to do work that a 15-ton locomotive can do, the first cost of machinery and iron must be very much greater, and that the cost of repairs, wear and tear of machinery and road, will be nearly double that required. On each wheel of American cars, not to exceed 2½ to 3 tons are put; but on each driving wheel of engines 5 to 7 tons are put, and hence the superstructure has to be made with reference to the weight on the driving wheels of the engine.

If the weight on each wheel of the locomotive can be reduced to 2½ or 3 tons, a great saving in cost of road can be made; hence one of the most important questions of railway economy is the proper adaptation of locomotive power.

The double bogie or Fairlie locomotive evidently has many advantages over the ordinary locomotive, for it admits of an equal subdivision of the weight on the wheels, and a much heavier and more powerful engine with a given weight per wheel. If there are six tons on the wheels of the locomotive and only three tons on the wheels of the cars, the permanent way must be made to sustain the six tons; hence the bogie locomotive will admit of lighter permanent way. The wheel-base of each bogie is practically the rigid wheel-base of the engine, which, for 60-ton engines of 4½-foot wheels is only 9½ feet; hence they will traverse very short curves, while the great length of the total wheel-base, or the distance between the centers of the extreme axles of the two groups, gives great steadiness to the engine without interfering with its flexibility, and they must adapt themselves with facility to the curvatures and inequalities of the road, and save largely in wear and tear of road and machinery.

The fuel and water being carried on the engine, the necessity for a tender is dispensed with, and the whole weight carried is made available for adhesion.

The details of construction may be far from perfect, but if all difficulties of construction can be overcome, its real merits will cause it to be generally adopted notwithstanding its complications.

By running light engines and light trains at low speed, much lighter cars, compared with the load, can be used, and by multiplying trains when the capacity of the road will admit of it, a given tonnage can be carried cheaper than by running heavy engines and trains.

On many railroads the rolling stock is not adapted to the traffic. Trains are hauled by engines capable of hauling twice as much as required. Engines of 30 tons weight are used to haul two or three passenger cars. The true way to economize is by making grades and curves as light as possible, running at low speed, and having a proper adaptation of rolling stock to road and business.

Every road should be located with reference to eventually having as light grades and curves as practicable, the maximum grade being adopted against the lightest trade, but the roads should be built and the rolling stock adapted to the demands of the traffic for the first

TRANSPORTATION AND MACHINERY.

1851 TO 1855 INCLUSIVE.	Tons carried.....	Tons carried one mile.....	Miles run by coal (tons).....	Charges due to running coal trains per mile.		Charges due to the transportation of coal, per ton.		Charges to which 10 per cent. must be added for grades of 25 feet per mile.		Constant charges.		Total charges.....	Charges per mile run, cents.....	Charges per ton per mile, cents.....	Average weight of loaded trains, tons.....	Average weight of empty trains, tons.....
				Total.	Per mile run, cents.	Total.	Per ton per mile, cents.	Total.	Per ton per mile.	Total.	Per mile of road.					
Transportation.....	9,084,067	778,343,562	4,409,327	\$2,528,038	286.01	\$1,357,850	0.896	.....	.....	\$365,229	\$3,847.50	\$4,251,118	480.572	2.7810	3322	1136
Average.....	1,816,813	155,668,712	881,865	505,607	57.2	271,570	0.173	.....	.....	73,046	768.90	850,233	96.115	154.63	664.4	227.2

ROADWAY AND RENEWAL OF TRACK.

1851 TO 1855 INCLUSIVE.	Tons carried.....	Tons carried one mile.....	Miles run by coal (tons).....	Charges due to running coal trains per mile.		Charges due to the transportation of coal, per ton.		Charges to which 10 per cent. must be added for grades of 25 feet per mile.		Constant charges.		Total charges.....	Charges per mile run, cents.....	Charges per ton per mile, cents.....	Average weight of loaded trains, tons.....	Average weight of empty trains, tons.....
				Total.	Per mile run, cents.	Total.	Per ton per mile, cents.	Total.	Per ton per mile.	Total.	Per mile of road.					
Roadway.....	9,084,067	778,343,562	4,409,327	\$2,528,038	286.01	\$1,357,850	0.896	.....	.....	\$365,229	\$3,847.50	\$4,251,118	480.572	2.7810	3322	1136
Average.....	1,816,813	155,668,712	881,865	505,607	57.2	271,570	0.173	.....	.....	73,046	768.90	850,233	96.115	154.63	664.4	227.2

few years. When the business of a road at first will be small, and it is necessary to construct as cheaply as possible, instead of making a narrow gauge it is better to economize as follows, viz:

1. Make a careful location with reference to the maximum grade which has been judiciously adopted for the whole road or each working division, in view of the cost and the demands of business; then locate and construct a cheap temporary parallel line where heavy, costly work is required to build the permanent road, as near as possible to the true location, using, if necessary, heavy, undulating grades to make the work as cheap as practicable at first, and to save time in building, and thus have a cheap road-bed, and most of the distance the true location and grades.

As soon after the road is built as may be required, the permanent road may be completed.

2. By the general use of undulating grades, without increasing the maximum grade or decreasing the capacity of the road.

3. By using light iron and rolling stock.

The gauge of a road cannot be widened without great cost and loss, but the grades can be made lighter, and the strength and weight of rolling stock and iron can be increased as the business of the road may require, without loss; for, as iron and rolling stock wear out, they can be replaced with heavier, changing gradually as the business requires.

It is economy to use some light rolling stock and iron on any road.

When roads are not worked up to their capacity, the effect of grades on the cost of transportation is chargeable to the cost of running the engines, and the extra wear and tear of road and machinery; all other cost is in proportion to the tonnage.

But when a road is to be worked to its full capacity, its greatest capacity is an important element in the calculation.

It is evident that the measure of the capacity of a railroad is the number and weight of trains which may be passed over it, and if, from adverse grades, or other causes, the trains are reduced one-half in weight, the capacity of the road must be reduced in the same ratio, and the expenses per mile of road are consequently at least doubled per ton carried.

Very few roads are worked to their full capacity, and lighter engines and lighter trains may be run, and at much lower speed.

No two roads may need exactly the same weight of engines and cars for true economy.

The cost of wear and tear of machinery and road is nearly the same whether heavy machinery is used and actually required on account of grades and the demands of business, or whether it is used without any reason and through ignorance of the true economy of operating.

In building a road, not only the first cost of road and stock should be taken into account, but the cost of operating. Grade reduces the capacity of a road and increases the cost of transportation far more than the owners of the roads realize. The effect of grades can be readily established by calculations showing the different loads that engines of given power can haul over different grades.

The following are some of the results of the workings of the Philadelphia & Reading Railroad for five years, taken from Mr. Steele's (Chief Assistant Engineer) report of 1855, with his calculations based on the actual cost of transporting 9,000,000 tons of coal 93 miles over virtually a level road.

"Grades of 25 feet per mile against the trade reduces the capacity (a level road being taken at 4,000,000 tons per annum), to 1,900,000. Grades of 50 feet reduce it to 1,200,000, etc. The average load of a locomotive I have taken at 437 tons, which is the result thus far obtained on that road."

"The average work of the Reading, for five years, was 1,816,813 tons per annum, or something less than half its ultimate capacity; the figures are, therefore, due to half the capacity of any other road which may be under consideration, and all less quantities than half capacity will be carried at greater cost."

Mr. Steele gives the following as the cost of transporting coal on roads of various grades exclusive of drawbacks, or of interest on capital:

"Level roads—average net load, 437.2 tons.
Capacity, 4,000,000 tons. No. trains, 7,149 Cost $\frac{1}{2}$ ton $\frac{1}{2}$ mile, 65-100c
 $\frac{1}{4}$ do. 2,000,000 " " " 4,574 " " " 69-100c
 $\frac{1}{2}$ do. 1,000,000 " " " 2,287 " " " 75-100c

"Grade of 25 feet per mile—net load, 293.5 tons.
Capacity, 2,113,449 tons. No. trains, 9,149 Cost $\frac{1}{2}$ ton $\frac{1}{2}$ mile, 90-100c
 $\frac{1}{4}$ do. 1,056,724 " " " 4,574 " " " 92-100c
 $\frac{1}{2}$ do. 528,362 " " " 2,287 " " " 104-100c

"Grade of 50 feet per mile—net load, 205.7 tons.
Capacity, 1,811,951 tons. No. trains, 9,149 Cost $\frac{1}{2}$ ton $\frac{1}{2}$ mile, 92-100c
 $\frac{1}{4}$ do. 910,975 " " " 4,574 " " " 99-100c
 $\frac{1}{2}$ do. 478,488 " " " 2,287 " " " 113-100c

"Grade of 75 feet per mile—net load, 128.8 tons.
Capacity, 1,178,392 tons. No. trains, 9,149 Cost $\frac{1}{2}$ ton $\frac{1}{2}$ mile, 131-100c
 $\frac{1}{4}$ do. 589,193 " " " 4,574 " " " 143-100c
 $\frac{1}{2}$ do. 294,593 " " " 2,287 " " " 164-100c

"Grade of 100 feet per mile—net load, 119.1 tons.
Capacity, 1,056,724 tons. No. trains, 9,149 Cost $\frac{1}{2}$ ton $\frac{1}{2}$ mile, 138-100c
 $\frac{1}{4}$ do. 528,362 " " " 4,574 " " " 151-100c
 $\frac{1}{2}$ do. 264,181 " " " 2,287 " " " 173-100c

"The capacity referred to is for double-track roads.

"If it were possible to pass trains so quickly in opposite directions over single-track roads, their capacity would be half that of the double track, but, as it is, it has been taken at one-fourth.

"We occasionally see it gravely asserted that grades are of small importance on railroads, but we have been reviewing, an extended system, in which the capacity varies from 500,000 to 4,000,000 of tons per annum, and this variation is produced by grades.

"If we compare two roads, each 100 miles long, the one having grades of 25 feet per mile, and the other level, and the demands of transportation on each amount to 2,000,000 of tons per annum, the difference in favor of the level road is \$600,000, or the interest on \$10,000,000.

"But the level road can do double the other, and that with the same amount of motive power, so that whilst the graded road is carrying its 2,000,000 of tons for net cost, the level road can, at the same prices, realize on its 4,000,000 of tons a profit of \$1,200,000, or the interest on \$20,000,000.

Mr. Steele's calculations are based upon the transportation of coal, which can be carried at less rates per ton per mile than general merchandise; but the relative difference of cost remains, and it is applicable to some considerable extent to the conveyance of passengers.

In the table at the top of this page is Mr. Steele's statement of the cost of transporting coal on the Philadelphia & Reading Railroad for five years, ending November 30th, 1855, including the charges due to transportation, machinery, roadway and renewal of track.

The average cost of transporting 9,084,067 tons of coal was 69-100 cents per ton per mile. The average paying load was 437 tons to 227 tons of non-paying load, and, including the empty return cars, 437 tons to 454 tons, not including weight of engines.

Mr. Steele's tabular statement of the effect of various grades on the load of locomotive engines of 42½ tons weight, including tender, fuel, etc., is as follows:

Grade per mile.	Gross load including engine, tender and cars.	Gross load exclusive of engine and tender.	Net load.	Ultimate capacity of a double track railroad.	Ultimate capacity of a single track railroad.
Level	767.5	725.0	437.3	4,000,000	1,000,000
25 feet	429.5	387.8	233.2	2,193,333	523,333
50 "	389.7	341.2	205.7	1,881,951	470,488
75 "	355.8	313.3	183.8	1,778,392	444,598
100 "	329.8	297.3	171.1	1,690,646	422,661
125 "	311.8	281.0	161.0	1,618,325	404,581
150 "	297.9	265.4	152.5	1,552,811	390,702
175 "	286.5	251.1	145.0	1,492,845	375,711
200 "	276.7	237.3	137.7	1,436,615	361,654
225 "	268.3	224.1	131.4	1,383,428	348,357
250 "	260.9	211.4	125.4	1,332,809	335,702
275 "	254.3	200.0	119.5	1,284,289	323,572
300 "	248.3	189.0	114.0	1,237,809	311,954

The average cash cost of single track on Western railroads cannot exceed \$25,000 per mile, and to build an additional track would cost say \$18,000 per mile. To reduce the grades one-half would not cost to exceed \$10,000 per mile on many of the roads, and not to exceed \$18,000 on any except at a very few points. As grades have so great an effect on the capacity of roads and the cost of transportation, the true economy is to increase the capacity and reduce the cost of transportation by reducing the grades as much as practicable before multiplying tracks.

The question for any road worked to full capacity is the economical size of engines and trains before reducing grades or multiplying tracks.

When the traffic is uniformly lighter in one direction than another the grades can be made steeper against that trade.

It is very important, however, to make the prices of transportation with reference to securing as far as possible an equal amount of traffic in each direction, so as to reduce the dead weight carried.

E. C. RICE, Civil Engineer.

ST. LOUIS, MO.

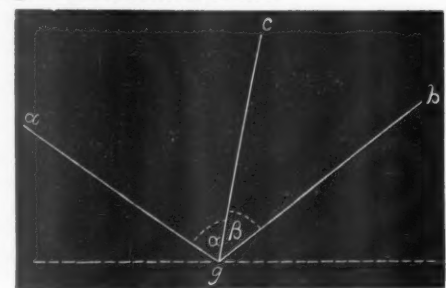
AXONOMETRICAL DRAWING.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Axonometry is becoming quite an interesting theme, and since axonometrical drawings have begun to be seen here and there in this country, engineers, especially mechanical engineers, are beginning to pay more attention to it.

The purpose of this kind of drawing is to represent all parts of the machine or other object to be drawn from their several axes, which can be ascertained by imagining the planes in which these parts lie.

It is known that the axonometrical projections are ranged in three different classes:



1. Isometrical; 2. Dimetrical; 3. Trimetrical.

For all these cases $g = 1$.

The following table, which has been found by practical experiments, gives the proportions of the most useful axonometrical projections:

	ga	gb	alpha	beta	Approximate.
1	1	1	60°	60°	tg(90°-alpha)tg(90°-beta)
2 a	1	1-2	82° 49'	48° 35'	1-8
C	1	1-3	86° 49'	46° 36'	1-8
c	1	1-4	88° 13'	45° 24'	1-32
d	7-8	7-4	65° 23'	65° 23'	5-11
e	3-4	3-4	76° 32'	76° 32'	1-4
3 a	9-10	1-2	81° 49'	72° 11'	1-11
C	23-24	1-3	87° 45'	69° 44'	1-25
c	5-6	2-3	78° 50'	71° 47'	1-5

I have used all these projections and found them to give a good picture and at the same time to allow a close measurement to be taken of the drawing. The last case, 3c, gives the best and easiest way of constructing, and is always used in my practice. Should any one desire further information on the subject, I will give it willingly on application.

E. G. GARTNER.

AN ANTI-ROCKING ATTACHMENT FOR CARS.

LaCROSSE, ILL., May 29, 1871.

TO THE EDITOR OF THE RAILROAD GAZETTE:

While reading your valuable journal of May 6th my attention was attracted by an interesting article contributed by Mr. Wm. S. Huntington, under the caption, "Why Do Railroad Carriages Oscillate?" in which, after explaining the different causes of vertical and horizontal oscillation (the most aggravating of which is inaccuracy of gauge), and the means that had been adopted to obviate the same, he closes with the inference that it is a necessary evil and must be endured.

A perfectly accurate gauge is clearly impracticable, and as nothing short of this will give immunity from the evil of horizontal oscillation, it seems to me we must seek rather to counteract the effect than to dispense with the cause.

Vertical and lateral movement, in a great degree, is dependent on horizontal oscillation, because the inertia of the carriage vibrated by reason of the truck follow

ing the inequalities of the rail, or by other cause, tends to force the carriage further than the springs will allow, causing "end thrust" or lateral motion.

I am of opinion that mechanical measures might be applied to the carriages to effectually stop the dangerous horizontal oscillation, thus, in part, overcoming the vertical movement. Apropos: I have before me an invention of Mr. Jas. R. Crabill, of La Crosse—the "anti-rocking attachment for railroad cars." As this invention has never been published, I will explain its construction and the principles involved.

The device consists of a rock-shaft, strongly pivoted to the end part of one of the cars, to which, near its end, are keyed, or otherwise securely and rigidly attached, two projecting arms; the outer ends of the arms are slotted vertically to receive the lower ends of the connecting-bars; the lower ends of the bars have each a curved slot formed in it to receive a pin attached to the slotted end of the arms; the end of each of the arms is slotted transversely to receive the end of a pin passing through and projecting from the sides of the end of the said bars. This construction allows the bars and arms to separate automatically as the cars are uncoupled and run apart and at the same time allows the bars to have a free vertical movement. The lower ends of the bars, close to the ends of the arms, are jointed to give the said bars a free lateral movement, the bars and arms being thus connected by a double-jointed connection. The upper ends of the bars are connected by a double-jointed connection to the outer ends of the arms, the inner ends of which are rigidly and strongly attached to standards whose lower ends are secured to the frame-work of the other car.

By this construction, when one of the cars may be vibrated, or rocked by a depression of a rail or other cause, the tendency will be resisted by the weight or inertia of all the other cars, so that no one of the cars of a train can rock without all the other cars rocking with it.

The device above described is attached to the body of the cars and in no way interferes with the movement of the trucks, which are allowed such movement as the condition of the rail or gauge may communicate, but while permitting the trucks with their springs to follow the inequalities of the rail or gauge, it holds the body of the car upright.

Although this invention has not, as yet, been subjected to a practical test, perhaps you may deem it of sufficient importance to insert the above description in your columns.

F. B. MODICA.

Terms of the New Jersey Lease.

By the terms of the proposed lease of the United Companies of New Jersey to the Pennsylvania Railroad Company the lessors demise all their canal and railroads, and property, real and personal, rolling and floating stock, etc., to the lessees for a term of 999 years (provided that nothing shall be taken to affect the right of corporate existence of the lessors), for the rent of \$1,948,500, being equal to \$10 per share, annually, on all the present outstanding capital stock of the lessors, clear of all taxes, payable quarterly on the first days of July, October, January and April—the first two quarterly payments to be made together on the first day of July, 1871.

The following is a digest of the lease:

I. The lessee to pay the rent at all times during the said term, notwithstanding any future action of any of the corporations or their stockholders; and in order to secure the individual interests of each stockholder of the lessors, the right is given to him to prosecute such suits as may be necessary to recover his proportionate part of the rent, and to use, if necessary, the name of the corporations lessors for that purpose; this provision, if desired, to be endorsed on the certificates of stock.

II. The lessee to pay all taxes, transit duties and other charges assessed or imposed on the lessors during the said term.

III. The lessee to defend all actions, and pay all amounts that may be recovered against the lessors, and indemnify them from all claims, etc., during the said term.

IV. The lessee to maintain and operate the demised works at its own expense, and to keep the same in thorough repair, working order and condition, fully supplied with rolling and floating stock and equipment, at least equal to that now used, so that the traffic and business shall be encouraged and developed, and full public accommodation given on reasonable terms.

V. The lessee to keep up the sinking funds of the lessors, and to pay all their debts and obligations as they shall become due.

VI. As the several loans of the lessors shall become due, they are to deliver to the lessee a corresponding number of the bonds secured by the mortgage of April 20th, 1871, whereby to discharge the same, any difference in value to be made up by the lessee. The difference between the total funded indebtedness and the amount authorized to be raised by the mortgage, to be applied only to permanent improvements on the works.

VII. The title of all after-required property to be

taken in the name of the lessors respectively, and such property to be subject to the lease.

VIII. To aid in the development of the "Harsimus Cove" property, the lessors, whenever the lessee shall have spent \$400,000 in improving the same, to issue to the lessee 3,000 shares of their stock, and so from time to time until \$3,000,000 shall have been so spent in such improvements, and 22,500 shares of stock issued. No other or further stock to be thereafter issued by the lessors. The stock so issued to bear the same rate of rent as the present stock, and to be paid in like manner clear of all taxes.

IX. The lessee to assume all the contracts, liabilities and other obligations of the lessors. All rights under existing leases to remain in full force in the event of the future re-entry by the lessors.

X. The lessee to pay \$10,000 a year, to enable the lessors to keep up their corporate organization—the first half-yearly payment to be made July 1, 1871; and to provide suitable offices in Philadelphia, Trenton and New York, for the accommodation of the directors and officers of the lessors.

XI. Such of the property of the lessors as may not be necessary for the use of the works may, with their assent, be sold, and the proceeds applied either to the permanent reduction of the funded debt, or to permanent additional improvements on the works.

XII. The accounts of the lessee to be open to the inspection of the President and officials of the lessors—the lessees to furnish annually on or before April 1st, a detailed statement of the business for the previous year ending December 31st, and the works and premises themselves to be likewise open to inspection and examination.

XIII. In case of default (continued for ninety days) in paying the rent, or performing these covenants and agreements, the lessors to have the right to re-enter upon the premises, to hold as of their original estate: the rent to be apportioned to the time of re-entry; no claim for damages for breach of covenant to be affected thereby.

XIV. At the end of the term, the lessees to re-deliver the works and premises to the lessors.

XV. Covenant for further assurance.

XVI. These covenants to bind both parties, their successors and assigns.

The following form of ratification is submitted to each of the stockholders in each of the several companies associated in the "United Companies":

"The undersigned, stockholders to one or more of the united canal and railroad companies of New Jersey, to-wit: The Delaware & Raritan Canal Company, the Camden & Amboy Railroad and Transportation Company, and the New Jersey Railroad and Transportation Company, do hereby consent to the lease and contract between the said United Companies and the Philadelphia & Trenton Railroad Company, of the one part, and the Pennsylvania Railroad Company, of the other part, referred to in the following resolution of the directors of the said united companies, passed on the thirteenth day of May, 1871.

"Resolved, That the directors of the united companies, viz.: The Delaware & Raritan Canal Company, the Camden & Amboy Railroad and Transportation Company, and the New Jersey Railroad and Transportation Company, corporations of the State of New Jersey, do hereby declare that it does to them seem expedient to lease the property and franchises of the said united companies, and of each of them, to the Pennsylvania Railroad Company on the terms and conditions set forth in the instrument of lease this day read to the board."

Date. | Witness. | Name of stockholder.

A full abstract of the lease will be sent to each stockholder, and copies of the instrument are kept for examination by stockholders at the office of Samuel Welch, No. 218 South Delaware street, Philadelphia; with Robert F. Stockton, in Trenton; with Alfred L. Dennis, in Newark, and at the companies' office in New York, No. 111 Liberty street.

The lease requires the ratification of two-thirds of the stock of each of the three companies in the United Companies. The New Jersey Railroad is represented by 62,500 shares, the Camden & Amboy by 50,000, and the Delaware & Raritan Canal by 49,996 shares. A negative vote of more than one-third of the shares of any one of the three companies will defeat the lease, even though both the other companies should be unanimously for it.

Philadelphia & Reading Railroad.

It has been known that for some months past a number of gentlemen connected with the Reading Railroad Company have been buying large bodies of valuable coal lands in the Schuylkill and Mahanoy coal regions, and it has been generally supposed that these purchases were made in the interest of the railroad company. During the present session of the Legislature an act of incorporation was obtained, and under it these lands will hereafter be held. They embrace in the aggregate about 50,000 acres of the most valuable and productive coal lands in the State of Pennsylvania, including nearly all the large bodies formerly held by individuals and coal companies in the first and second coal fields—such as the Manhattan Coal Co., the Philadelphia and Mahanoy Coal Co., the Tremont Coal Co., the Preston Coal Co., the Ashland Estate, the Locustdale Estate, the Locust Gap Improvement Co., the Fulton Coal Co., McIntyre lands, Big Mountain Improvement Co., Phoenix Park Estate, Branchdale Estate, Gettle and Wagner Estate, Mount Laffee Estate, and a number of other smaller tracts. It is believed that, owing to the very depressed condition of the coal interests, resulting from the repeated strikes and suspensions of the

last two years, and the consequent inability of individual coal-land owners to manage and control their own property, these lands have been bought at very much lower prices than they could have been obtained for at any previous time within the last ten years, and it is claimed that the average price per acre paid for them has been from one-third to one-fourth of what has been lately paid for lands of the same intrinsic value in the Wyoming and Lackawanna regions. The stock of this new coal company will be held by the Philadelphia & Reading Railroad Company, ample authority for this purpose having been conferred by the act of incorporation above referred to. The policy of controlling the ownership of the coal lands that supply the road with traffic has been a favorite one with the present management of the Reading Railroad Company. It is claimed that these lands alone can produce from ten to fifteen millions of tons of coal per annum for centuries to come, and when it is remembered that they are connected by means of a continuous down-grade line of the very best character with tide-water at Philadelphia, from which the entire Atlantic seaboard can be supplied with fuel, it will be found that the Reading Railroad Company now occupies a position so impregnable that its tonnage can never be taken from it—as no rival lines can interfere with the growth of a traffic which is supplied by lands controlled directly by the transporting company itself. The money required for this new enterprise will be raised by a loan made by the Reading Railroad Company. All of the branch lines of railroads which were owned entirely by the company have been lately merged into, and consolidated with, the Philadelphia and Reading Railroad Company. And a new consolidated mortgage upon all the property and franchises of the latter company will be issued to secure bonds to the amount of \$25,000,000. These bonds will all have forty years to run, and will be 7 per cent. currency, both coupon and registered; 6 per cent. gold, both coupon and registered, all in sums of \$1,000 each; and 6 per cent. sterling in £300 each; all the issues being free from taxes. Out of this issue of bonds \$6,000,000 will be set apart to retire all the present mortgage loans of the company, amounting to \$5,807,000, so that the new loan will practically be a first mortgage loan upon all the property of the company. The following statement of the assets of the company has been prepared to show the amount of property on which the new loan is secured:

Railroads—including main line, Lebanon Valley, Northern Liberties & Penn Township Branch, Lebanon & Pine Grove Branch, Pine Grove & Lebanon Railroad, Loberry Railroad, Union Railroad, Good Spring Railroad, and Mahanoy & Shamokin Railroad, with their laterals and sidings, aggregating 648½ miles of single-track road	\$31,864,000
Depots—embracing all depots, terminal and wharf buildings, etc.	3,998,001
Real estate—embracing properties held in fee simple, and not included in the items of railroads or depots	8,317,605
Locomotive engines and cars	10,633,900
Stocks and bonds held by the company	4,325,353
Steam collieries	529,486
Coal barges	580,152
Debits due the company, cash and uncollected bills	4,092,038
Materials on hand	1,300,529
Total	\$64,800,874

The leased lines of railroad and canal held by the Reading Railroad Company are also embraced in the mortgage, though not included in the values in the above statement. The Fidelity Insurance, Trust & Safe Deposit Company, of Philadelphia, will be the trustee, and the mortgage provides for a cumulative sinking fund, of one per cent. per annum upon the outstanding bonds, beginning with the year 1873. Out of the new loan, after setting apart the \$6,000,000 to retire the present mortgage indebtedness of the company, \$19,000,000 will be left for the purchase and development of coal lands, and the acquisition of other new property necessary for the increased traffic of the company. All of the property thus acquired will be added as a security to the new loan, so that the entire amount of \$25,000,000 when issued will be secured by property worth over \$80,000,000, exclusive of the value of the numerous leased lines of railway and canal now held by the company. The following table prepared from the yearly reports will show the gross receipts, expenses and net profits of the company for each of the last nine years:

YEARS.	Gross Receipts.	Gross Expenses.	Net Profit.
1862	\$3,911,830	\$1,852,333	\$2,059,497
1863	6,252,902	2,955,791	3,297,108
1864	9,269,341	5,001,528	4,267,813
1865	11,471,808	6,339,318	5,141,490
1866	11,805,461	6,791,102	5,014,359
1867	9,222,088	6,306,434	2,915,654
1868	8,962,883	6,162,511	2,799,372
1869	11,275,241	6,876,313	4,398,928
1870	9,749,419	6,564,991	3,184,428
Total	\$81,319,025	\$48,801,314	\$32,517,711

The fluctuations in the amounts of gross receipts during the last three years were owing principally to repeated suspensions in the mining regions. The average profits of the company during the nine years have been \$3,613,146.78 per annum. An association of American and English bankers have purchased from the company all of the new loan that will be negotiated during the present year, and it is presumed will soon offer it to the public in this country and in Europe.—*Philadelphia Ledger*, May 22.

—The *Trenton Gazette* says it has been assured by the highest authority that the rates of freight and passenger traffic across and in the State of New Jersey will be materially reduced soon after the consummation of the lease of the railroads to the Pennsylvania Central.

—The Lochiel Iron Works will be offered for sale at auction, at Harrisburg, Pa., on the 21st of June. The sale will include the grounds, nearly 43 acres, the large rolling mill, machine and blacksmith shops and machinery, and all the buildings of the company.



PUBLISHED EVERY SATURDAY.

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Editorial Announcements.

Correspondence.—We cordially invite the co-operation of the Railroad Public in affording us the material for a thorough and worthy Railroad paper. Railroad news, annual reports, notices of appointments, resignations, etc., and information concerning improvements will be gratefully received. We make it our business to inform the public concerning the progress of new lines, and are always glad to receive news of them.

Inventions.—Those who wish to make their inventions known to railroad men can have them fully described in the RAILROAD GAZETTE, if not previously published, FREE OF CHARGE. They are invited to send us drawings or models and specifications. When engravings are necessary the inventor is expected to furnish his own engravings or to pay for them.

Engineering and Mechanics.—Communications and correspondence relating to these subjects should be directed to M. N. Forney, No. 73 Broadway, New York. Subscriptions and advertisements will be received at the New York office, and any other business transacted with those to whom that office is most convenient.

Articles.—We desire articles relating to railroads, and, if acceptable, will pay liberally for them. Articles concerning railroad management, engineering, rolling stock and machinery, by men practically acquainted with these subjects, are especially desired.

Our Prospectus and Business Notices will be found on the last page.

THE ST. CHARLES BRIDGE.

The new bridge over the Missouri River at St. Charles, 21 miles from St. Louis, is completed, and its formal test on Monday of this week was witnessed by a large gathering of engineers, railroad officers and others. The work is one of extraordinary interest, both as a difficult and remarkable engineering achievement, and as affording to St. Louis a more perfect means of communication with Northern Missouri and the States adjoining. Ever since the North Missouri Railroad was built, and more particularly since its extension to Kansas City, and the building of the Iowa lines, it has been evident that the Missouri River must be bridged in order to compete successfully with rival lines and rival cities; and while the opposition of those who believed its construction would prove a hindrance to the river traffic, and lack of faith in the financial success of the enterprise, delayed the commencement of the work for many years, its completion was still more retarded by the engineering difficulties offered by the changing bed and varying currents of the great stream, which, according to Captain Eads, "apparently sets at naught the most approved theories, and overrides the most scientifically devised schemes for its conquest." In the year 1866 the North Missouri Railroad Company advertised for prize plans for the best bridge adapted to the situation, and from those presented one was selected which provided for resting a wooden Bollman truss on stone piers. The plan seemed perfect, and it was approved, adopted and—abandoned. In 1865 Mr. C. Shaler Smith (now President and Chief Engineer of the Baltimore Bridge Company) was appointed Chief Engineer of the St. Charles Bridge, and his plans, submitted after having made an elaborate series of experiments on the currents of the river, were accepted, and at last the work was begun, September 14, 1868.

The first two piers on the St. Charles side were erected without serious difficulty, the first being ninety-six feet from the top of the masonry to the solid rock, and the second one, standing where the thrust from the ice might be expected to be particularly severe, was sunk and wedged six feet in the solid rock.

The construction of the next—the third—pier was involved in difficulty. A caisson was brought into requi-

sition. After passing downward through the sand, a layer of boulders was reached which was thought to be the solid rock. Preparations were made to commence a foundation, when experiments proved that it was a loose stratum, and unfit for permanent work. The removal of this obstruction proved a difficult task, but it was finally accomplished. When all was ready the second time to commence the foundation the flood of July, 1869, came and crushed in the side of the caisson. A mass of drift struck it and the side gave way. This accident delayed the foundation of this pier nine months, and was one of those annoying incidents against which no ordinary forethought could provide. The pier was finally completed. Its height is 105½ feet.

In the construction of the pier numbered eight, which stands nearest the south bank, considerable progress was made in the winter of 1868-69. In the spring the river took a new freak and cut away 1,435 feet from the north bank, above the bridge, making a tremendous bend, which threw the current upon the base of this pier. The danger was imminent, and the engineer in charge immediately gathered his forces and, at great cost and with considerable difficulty, threw out a dike from the south side, by which the direction of the current was diverted. This dike was continued in a generally semi-circular form so as to enclose piers 6, 7 and 8, and confine the channel of the river to passing under three spans of the bridge. The three piers enclosed in the dike are all of the same class, resting on a pile and concrete foundation, the concrete enclosed in a circle of guard piles extending thirty feet below the river bottom to the solid rock.

Pier number 4 was sunk in a bottomless wooden caisson, loaded with about one thousand tons of stone, and was let down by dredging through successive layers of sand, boulders and drift, until rock was reached at a depth of 54 feet below low water mark.

The last pier constructed (No. 5) was sunk by pneumatic pressure, and was the most difficult and expensive work of the substructure. A deposit of sand at the pier side rendered it necessary to scour to a sufficient depth to float the pontoons by means of powerful jets of water. The resistance of friction by the sand in sinking the caisson was unexpectedly great, requiring a pressure of from six to seven hundred pounds to the square foot to keep it in motion. This is the highest pier of all, being one hundred and forty-five feet from the rock to the top of the masonry.

While work on the pier was still in progress arrangements for putting on the superstructure were completed, and the building of the approaches, requiring nearly 4,400 feet of trestle work, was commenced. These approaches are, from both directions, on curves, and for their support forty iron trestles on each side of the river were based on masonry, and for some distance filled in with earth.

Contracts for the cast iron work on the bridge and approaches were let to Messrs. J. B. Allen & Co., of St. Louis; the Keystone Bridge Company and the Phoenix Iron Company each furnished one-half the rolled and shape wrought iron; the Keystone Company furnished the rolled wrought iron; and the forged wrought iron was all supplied by the Norway Works, at Wheeling.

The seven iron spans of the bridge proper, exclusive of the approaches, extend over a distance of nearly 2,180 feet. The lengths of the spans, in order, commencing at the St. Charles end, are 305, 317½, 317½, 321½, 306½, 306½, and 305 feet. The first span and the last three spans are of the form known as the Fink Suspension Truss, the track resting on the deck of the bridge. The three spans over the main channel are through spans, and each may be described as a double triangular or trellis girder truss. The top of these through spans stands thirty-seven feet above the top of the masonry, and there is a clear space of eighty feet between the iron work and ordinary water mark. The iron work in each of the deck spans weighs about 344 tons, and in each of the through spans about 390 tons.

Each piece of iron in the bridge has been tested to ten tons to the square inch, while the greatest strain that can be brought to bear in the bridge cannot exceed six tons. The entire bridge is constructed to sustain a weight of twenty thousand tons, while the greatest weight that can be put upon it is twelve thousand tons.

The main spans are, we believe, the longest now existing on this continent, with the exception of the Louisville Bridge, which has twenty-seven spans, one 400 feet; the rest being each less than 300 feet. The longest spans in the Steubenville and Parkersburg bridges are each 300 feet. The Illinois & St. Louis Bridge, when completed, will have three of the longest spans in the world, each about 550 feet.

The following statistics of the work will give some idea of its magnitude:

Extreme length of bridge and iron trestle work, feet.....	6,570
Extreme length of bridge proper, feet.....	2,178½
Earth excavation, yards.....	354,000
Concrete used, yards.....	39,000
Piling (lineal foot), feet.....	103,000
Lumber and timber, feet.....	3,186,000
Wrought iron, pounds.....	4,404,000
Cast iron, pounds.....	2,708,000
Iron in caissons, pounds.....	517,000
Masonry in bridge proper, yards.....	12,000
Masonry in shore approaches, yards.....	4,000
Rip-rap in pile foundations, yards.....	35,000
Distance above high water of 1844, feet.....	51
Distance above low water, feet.....	99
Distance above ordinary water, feet.....	86
Area of premises occupied on St. Charles shore, acres.....	16
Average number of men employed.....	400
Largest number of steam engines employed at one time.....	29
Pile drivers in actual use.....	7

The completion of this bridge is one of the great works of the year. A very important work in the railroad connections it affords, and a particularly valuable one to the engineering profession in the difficulties which have been met and overcome by devices and methods entirely new. It is almost without a precedent, a monumental work that will probably prove a paying investment to its stockholders. Already one million seven hundred and fifty thousand dollars have been expended and an outlay of sixty-five thousand dollars more will be required before the bridge can be considered complete. The annual rental paid by the North Missouri Company is fixed at \$150,000.

The value of the work to St. Louis cannot easily be overestimated. So long as the Missouri remained unbridged, that city was so cut off from all the populous and fertile country north of the Missouri River that it could conduct business with it only at a disadvantage. Chicago long ago found the transfer by ferry across the Mississippi at a distance of 150 and 200 miles an unendurable obstacle to traffic, and there are now no less than six bridges spanning that stream within 200 miles of latitude, from Dubuque to Quincy. The Missouri has been to St. Louis similar to what a stream would be to Chicago which should cut off all the lines of the Chicago & Northwestern within twenty miles of the city. The St. Charles Bridge insures quicker and more certain transportation between St. Louis and Kansas City, Omaha, all the country on the Union and Central Pacific roads, St. Paul, Duluth, and the intermediate country. That is, it improves the connections of St. Louis with one half of the territory and more than one-half of the population with which that city has dealings. The North Missouri is the railroad which gains most by this improvement, as it is for the present the only railroad with a terminus in St. Louis which has lines north of the Missouri; but all railroads in North Missouri and further north which have any considerable traffic from or for St. Louis will be benefited by the St. Charles Bridge.

We purpose in a few weeks giving full illustrations of the work and a more minute account of its engineering features.

MASCULINE RIGHTS AND FEMININE WRONGS.

The New York Sun gives the following account of, and comment on, an "unpleasantness" which occurred in Indiana:

"On some Western Railroads they have what are called ladies' cars, to which no male passengers are supposed to be admitted unless accompanied by ladies. This is an agreeable arrangement for ladies and their escorts; but as it frequently happens that the only other cars provided are exceedingly filthy and unpleasant, it is not always so satisfactory to gentlemen who are traveling alone. On the Louisville, New Albany & Chicago Railroad, last February, a Mr. Kimball had taken a seat in one of these ladies' cars, and, after accomplishing a part of his journey, was ordered by the brakeman to move into another car. Declining to do so, he was grasped and held by the conductor while the brakeman and another man beat him severely. For this the railroad company, by the verdict of the Indiana jury, have been compelled to pay the sum of twenty-seven hundred and fifty dollars; and it serves them right."

It is quite possible that this decision of the court may abolish the practice of running what are called "ladies' cars" on the roads in Indiana; but although old bachelors generally may rejoice thereat, yet it is not plain that such discrimination is altogether unwise. So long as the "abomination of expectation" is permitted, it seems desirable that there should be separate cars for the wearers of long skirts. None of us like to see our wives or daughters compelled to travel for hours in the society of men whose habits and conversation are offensive. The deference and respect which, we are happy to say, is almost universally shown in this country to women, makes it comparatively easy to carry into effect a rule for the division of travelers into two classes, one composed exclusively of males, the other of females and that portion of the sterner sex who are under feminine influence and control. The adoption of this rule is, in fact, a recognition of the restraint which the gentler sex imposes on the ruder masculine portion of society. It is saying, in effect, that railroad compa-

nies always feel sure that passengers will conduct themselves with more decorum in the presence of ladies than they will when alone. While all this is true, and probably such a classification is better than none, yet there often is very great injustice in compelling a gentleman to occupy cars filled with ribald men, whose conversation and habits are very offensive. The erroneous idea with regard to universal equality which prevails so generally in this country makes it exceedingly difficult to enforce regulations which imply that any persons are in any way superior to others, even though it be to say simply that those who never wash themselves shall not sit in the same seat with those who do. There are people who value cleanliness, and to whom obscenity and profanity are extremely offensive, and are so at all times; and it is obvious injustice to compel them to submit to the annoyances to which they are subjected if excluded from the cars which are clean, and expelled to those which are not. Cleanliness is a luxury which costs money. To keep the upholstery and the floors clean is a constant expense to railroad companies. Some travelers value this, while others do not. It would, therefore, be entirely fair to permit those who do value it enough to pay for it to enjoy it. Practically, experienced travelers have learned that few brakemen will resist a small fee, and that by paying it, a gentleman can be admitted into the exclusive precincts of a ladies' car. A practice of this kind is, of course, evil, as all forms of bribery are. It is plain, however, that persons who do not care for cleanliness or decency would not pay for the luxury. The best cars are nearly always more expensive, both in original cost and for maintenance, than those not set apart for ladies, and therefore the companies should be paid for keeping them in good condition. It is to be presumed that the present rate of charges sufficiently compensate railroad companies for keeping up the equipment which they run. It would, therefore, be unjust to the public to increase their rates of fare; but it would be entirely just to exact a larger proportion of the present charges for the better accommodations, and a smaller proportion for those which are less expensive; or, in other words, to recognize what must be done sooner or later, that there are two classes of travelers; and charge the one more, and the other less, than they pay now. This would be an advantage to both, and no injustice to either, and would obviate the evil to which all gentlemen who travel alone are subjected—that of expulsion to dismal cars appropriated to "single gentlemen."

A Rival of the Central Pacific.

There have been of late several reports that a combination has been made between the Pennsylvania Railroad Company and the California Pacific Railroad Company, for the purpose of connecting the Union Pacific at Ogden with San Francisco by a route independent of the Central Pacific. There has been no confirmation of these reports, and they have seemed quite improbable, if not incredible, but the California papers have expressed some confidence in the truth of the report, and have gone so far as to describe the route, and this it will be interesting to consider.

The California Pacific is not very well known away from the Pacific coast. It was the first line to connect San Francisco with Sacramento, and is now the shortest. It extends from Vallejo, at the northern end of San Francisco Bay, twenty-three miles from San Francisco, northeast sixty miles to Sacramento. From Daviesville, within twelve miles of Sacramento, it has a branch extending north by east forty-two miles to Marysville. From Marysville there is a road known as the Northern California, extending northward up the Feather River twenty-six miles, to Oroville. The line from Vallejo to Oroville, 116 miles, lies in the proposed new route to Ogden. It is to be extended, so reports say, in the same general direction (east of north) to the northeast corner of California, passing west of Beckwourth Pass, along the southeast side of Goose Lake, thence to the Christmas lakes in the State of Oregon, whence the line would turn more directly eastward, crossing the southeast corner of Oregon, and reaching the Snake River, in Idaho, the course of which it would follow eastward to a point about 50 miles north of Great Salt Lake, where it would turn southeastward and to the Union Pacific.

Such a line would gradually diverge from the Central Pacific at Daviesville, where it is but 12 miles distant, to Goose Lake, 125 miles distant; thence for about 300 miles it would be everywhere as much as 100 miles north of the Central Pacific, after which, for 75 or 100 miles, they would gradually approach each other, and afterward come together very rapidly.

A San Francisco paper says that the proposed line would be about 1,000 miles long, and only 100 miles longer than the Central Pacific. As it extends 125 miles

further north than the Central Pacific, and has to return an equal distance southward to meet the Union Pacific, it is plain that the line must be much straighter than that of the Central Pacific if the difference is no greater than 100 miles.

It is not easy to discover any adequate inducement for the construction of such a railroad. It is true that the parallel route, the Central Pacific, is a fairly productive property, but the Government paid a large share of the cost of this road, and it has all the through traffic. Even should such an arrangement be made with the Union Pacific as should insure the proposed line nearly all the through business from Omaha, still the route would be long, and there would probably be by that time two other Pacific railroads.

A more reasonable scheme would seem to be the connection of San Francisco with the Northern Pacific Railroad at some point in Idaho, which could be effected by a line identical with that described as far as Goose Lake and the Christmas lakes, whence it would continue in the same general northern direction to the Snake River, and down instead of up that river to the junction. Such a road would connect San Francisco with the mining regions of Idaho and Montana, and it would give the Northern Pacific a connection with California and San Francisco, where, in spite of isothermal lines and the great harbors of Puget Sound and the Columbia River, the great bulk of the population of the Pacific coast is living.

Burlington to Kansas City.

A correspondent suggests that there is a good route for a railroad from Burlington, Iowa, to Kansas City, and that such a road would make a shorter line from Chicago to Kansas City than any now existing, and would pass through a very fertile country.

An air-line from Burlington to Kansas City is just about 220 miles long, and passes through a fertile and quite populous country, at a sufficient distance from other railroads, completed or in progress, to command a fine local traffic—for much of the way for 15 or 20 miles on each side. As the distance from Chicago to Burlington is 207 miles, if we add ten per cent. to the length of the air-line from Burlington to Kansas City to make the estimated length of a practicable railroad route, we will have 449 miles as the distance from Chicago to Kansas City by the proposed line, which is just 40 miles less than by way of Quincy. The value of the line, however, will depend on its command of local traffic; for by next fall there will be three short lines from Chicago to Kansas—as many as between Chicago and New York, with of course, only a fraction of the through traffic. The prospect of constructing such a road, probably, depends greatly on the policy of the Hannibal & St. Joseph Company. If it should break its alliance with the Joy roads (as is not impossible), very probably a line would be opened between Burlington and Kansas City in a few months. But here again the route would depend chiefly upon the prospect for local traffic. If the air line would be profitable without through traffic, it might be preferred, but if the through business, and especially if speedy completion were desired, these objects could be attained more easily by constructing a branch of the Burlington & Southwestern from Unionville, or some other point further west. When the Burlington & Southwestern is opened to a junction with the Kansas City, St. Joseph & Council Bluffs road, a new route from Chicago to Kansas City, only about 500 miles long, will be obtained without the construction of any Kansas City branch, and will be in the Joy interest, we believe. However, a new Burlington & Kansas City line is much more plausible and promising than scores of lines now actually in progress. It would be in the natural route of commerce, would have good through connections, and, if well located, would command a good local traffic.

Improvement of the Kankakee and Iroquois Rivers.

A corporation under the name of the Kankakee Company, of which Governor William Claflin, of Massachusetts, is President, and H. O. Alden, of Belfast, Me., E. P. Carpenter, of Wilmington, Ill., Joel H. Hills, of Boston, and Richard P. Morgan, Jr., of Bloomington, Ill., the other directors, has been incorporated in Illinois for the purpose of creating navigation and water power on the Kankakee and Iroquois rivers. The work is now under contract to the well known firm of Willis, Phelps & Co., of Springfield, Mass., and is partly completed for ten miles above and below Wilmington.

The Kankakee River has its source some distance northwest of Plymouth, Ind., and flows thence westward, uniting with the Des Plaines to form the Illinois,

nine miles below Wilmington. About five miles above the town of Kankakee it receives the Iroquois, which flows west by south nearly parallel with and about twenty-five miles south of the Kankakee to a point in Iroquois County twenty-two miles nearly due south of Kankakee, whence its course is nearly due northward.

It is proposed to create slack-water navigation on these streams by the construction of suitable dams and locks. It is said that by the expenditure of not more than one million dollars, a depth of water of five feet at the lowest stages may be had on one hundred and seventy miles of these streams, one hundred miles of which will be in Illinois and seventy in Indiana. In the upper part of the courses of these streams, in Indiana, they pass through great forests of valuable hard-wood timber, such as is used in the manufacture of agricultural and other machinery, furniture, etc., and close to inexhaustible deposits of bog iron ore, which is very cheaply removed—it cannot be said to be "mined." At the lower end of the route are the great coal mines of Wilmington. Thus the channels rendered navigable are likely to have a traffic which does not now exist, in carrying coal eastward, for local supply, and ore westward, for smelting at the coal mines. The improved navigation will connect with the Illinois & Michigan Canal at the mouth of the Kankakee, so that Lake Superior ore, to be mixed with bog iron ore, may be obtained by a water route and only one transfer—from the lake vessels to the canal boats at Chicago.

But it is not simply by the supplying of cheap transportation between ores and material and fuel that the Kankakee company hopes to establish manufactures along the lower Kankakee. It claims that it will obtain from its dams a water power exceeding that of the Merrimac, the Saco, or any other New England stream, and that the available water power at Wilmington will exceed that of Lowell, Mass.

Thus, with cheap and abundant water power and coal, and easy access to iron ore and timber, Wilmington and its vicinity would have advantages for manufacturing rarely equaled. It would have the further advantage of water routes and railroad routes for the distribution of its heavy and light manufactures.

The Chicago & Michigan Lake Shore Railroad.

Chicago has always had close relations with the eastern shore of Lake Michigan. Most of the products of that section—chiefly lumber, but including a large part of our supply of summer fruits—find their market in this city, and our merchants sell the lumber towns the largest part of their tools, machinery, supplies and merchandise. The communication in summer has been cheap and frequent to the more important towns, there being, besides the great fleet of sail vessels engaged in carrying lumber, a number of steamers plying between this port and St. Joseph, Grand Haven, Muskegon, etc. But as the population on this shore has increased, and the towns grown in number and importance, the necessity of quicker and more frequent communication with their great market has become more and more evident with every year, and especially with every winter when most of these towns had only the communication with the rest of the world which could be maintained by sleighs. The growth of the country meanwhile promised to continue and to be permanent. Districts heretofore utilized only by lumbermen have been attracting farmers in great numbers, who find in many places not only a fertile soil, but a peculiarly genial climate and the capacity for the production of many fruits which do not prosper at all or but poorly, on the opposite shore, for which there is a demand throughout a large part of the prairie States.

So there was, in spite of the competition of the vessels on the lake, a promising field for the Chicago & Michigan Lake Shore Railroad, which this week has been completed from New Buffalo, its junction with the Michigan Central 66 miles from Chicago, down the eastern shore of Lake Michigan to Whitehall, a distance of 139 miles. The road has been open some months from New Buffalo through St. Joseph to the junction with the Kalamazoo & South Haven line, 61 miles, and from Whitehall southward 32 miles, through Muskegon to Nunica, the junction with the Detroit and Milwaukee road. The 46 miles between the South Haven Junction and Nunica have been constructed this season and completed this week, and in a few days we may expect to have trains running daily between Chicago and Whitehall, stopping at St. Joseph, Saugatuck, Holland, Nunica and Muskegon.

The road is to be extended northward from Whitehall through Pentwater and Pere Marquette to Manistee, when it will have stations at all the great lumber ports of Lake Michigan.

From New Buffalo to St. Joseph the road keeps close along the lake shore. Thence northward it is distant from it from four to ten miles, generally passing near the head of the small lakes and estuaries which form the harbors of Lake Michigan, and on which the towns are built. At Holland it crosses a railroad from Allegan via Holland and Grand Haven to Muskegon, known as the Michigan Lake Shore Railroad, and thence to Muskegon, 20 miles, the two roads are but a few miles apart. The latter takes its traffic to the Kalamazoo Division of the Lake Shore & Michigan Southern, but will, we believe, eventually form a part of the road from Allegan through Battle Creek and Coldwater to Mansfield, O., and will be worked rather for eastern than for western business. The Chicago & Michigan Lake Shore, with its trains running through to Chicago, on the shortest possible line, will be likely to command most of the Chicago business which does not go by lake.

The Huntington Track Gauge.

The track gauge described and illustrated on the first page of this number of the GAZETTE, as should have been stated in the article itself, is entirely the invention of Mr. Wm. S. Huntington, of Byron, Michigan, whose large experience in tracklaying, and many interesting papers in the RAILROAD GAZETTE, have caused him to be well and favorably known to railroad men generally.

Erratum.

In an article entitled "Why do Railroad Carriages Oscillate," on page 61 of the present volume of the RAILROAD GAZETTE (in the number for May 6) in the fifth line from the title the writer is made to say "It is possible that the size of cylindrical wheels would remedy the evil to a limited extent." For "size" read "use," and thus make sense of non-sense.

Housatonic Railroad Report.

The Housatonic Railroad extends from Bridgeport, Conn., (59 miles east of New York, on the New York & New Haven Railroad) nearly due north across Western Connecticut to the Massachusetts line, a distance of 74 miles. It operates under a lease the Berkshire Railroad, which extends across the southwest corner of Massachusetts from the Connecticut line northward to West Stockbridge, 21½ miles; the West Stockbridge Railroad, 2½ miles long, which extends the latter road westward to the New York line; and the Stockbridge & Pittsfield Railroad, from Van Deusenville, 87 miles north of Bridgeport, east and north to Pittsfield, 22 miles, where a junction with the Boston & Albany road is formed. Thus the total length of road operated is nearly 120 miles. It is operated as a main line from Bridgeport to Pittsfield, 110 miles, with a branch from Van Deusenville to West Stockbridge and the New York line.

The receipts from operations of this road for the years ending December 31, 1869 and 1870, were as follows:

	1869.	1870.
From freight.....	\$420,053 14	\$454,610 70
" passengers.....	27,879 36	208,304 10
" mails.....	7,180 00	10,927 00
" express.....	5,380 63	10,000 00
" rents.....	1,137 80	1,396 52
" wharfage.....	1,752 86	1,692 41
" milk.....	41,162 75	53,938 82
" dividends.....	50,996 00	11,388 00
" miscellaneous.....	1,669 40	.....
Total.....	\$743,907 94	\$793,097 55
EXPENSES.		
Repairs of road.....	\$188,445 35	\$240,402 07
engines.....	20,565 00	39,617 35
cars.....	51,147 32	70,189 90
buildings.....	13,611 38	30,642 46
tools.....	4,820 10	4,939 63
dock.....	4,481 86	6,113 43
Wood and coal.....	62,495 22	50,932 50
Oil, tallow and waste.....	7,066 25	5,137 23
Stationery, etc.....	4,588 69	3,391 21
Freight expenses.....	69,115 86	72,536 56
Passenger expenses.....	34,508 70	37,308 29
Contingent expenses.....	535 99	1,376 70
General expenses.....	8,492 73	13,866 56
Damages.....	16,638 29	5,946 25
Advertising.....	810 31	434 03
Rent of cars.....	6,113 77	10,570 92
Insurance.....	545 25	902 20
Gas light.....	1,134 17	985 16
Profit and loss.....	25,986 83	740 00
Total.....	\$333,463 97	\$405,072 60
Balance.....	\$210,313 97	\$14,024 95

There were further expenditures of \$109,205.85 for taxes, rentals, coupon interest, etc., so that the net gain after deducting all expenses was but \$37,819.10. The surplus of last year, \$153,257.43, added to this, enabled the company to pay semi-annual dividends of 4 per cent. on the preferred stock.

There is \$820,000 of common stock, \$1,180,000 of preferred stock, and a bonded debt of \$341,000.

—The Kansas Supreme Court has sustained the validity of the county bonds for railroad purposes, holding their issue to have been constitutional. Judge Brewer, one of the three justices, dissents.

General Railroad News.

CHICAGO RAILROAD NEWS.

Michigan Central.

On Thursday of this week the company commenced operating their eleven and one-half miles of road from Niles to South Bend, which has been lately completed. Three trains each way will run daily over the road. The only intermediate stations are Bertrand, 5¼ miles south of Niles, and St. Mary's, very near South Bend, where the University of Notre Dame and St. Mary's Academy are situated.

The arrangement, referred to in these columns last week, by which the Indianapolis, Peru & Chicago Company will send its Chicago business over the Michigan Central from Michigan City, has been consummated, and its passenger trains now connect with the New York express arriving here at 7:05 p. m., and leaving here at 9:00 a. m. Through sleeping cars between this city and Indianapolis will soon be put on this route. The arrangement made by the Michigan Central Company is to let the Indianapolis Company in upon their grounds at Michigan City and do their Chicago business for a compensation.

The erection of the new shops at Jackson will be commenced at once. The engine house will be 54 feet wide and of sufficient length to hold 52 locomotives.

It is reported that the company has filed a claim with the Commissioner of Internal Revenue for refunding the stock dividend tax collected on capital representing permanent improvements of the road. It is contended that the government has no right under the law to compel the payment of such tax.

Illinois Central.

The annual meeting of shareholders was held in New York City on Wednesday of this week (the 31st ult.) and five new directors were elected: Messrs. J. Pierpont Morgan and Louis Von Hoffman, of New York, and John Newell, of Chicago, to serve until May, 1875; Lucien Tilton, of Chicago, to serve until May, 1873, and William H. Gebhard, of New York, until May, 1874.

The first three of these directors supply the places of Messrs. R. Daniel Wolterbeck, Cunningham Borthwick and H. H. Hunnewell, whose terms expired by limitation. Mr. Tilton takes the place of Henry Chauncey, resigned, and Mr. Gebhard fills the vacancy occasioned by the death of Thomas E. Walker.

The board of directors now consists of: John M. Palmer, Governor, *ex officio*.

Abram S. Hewitt, William Tracy and W. H. Osborn, until May, 1872.

John M. Douglas, George Bliss and Lucien Tilton until May, 1873.

William H. Gebhard, Wilson G. Hunt and Jonathan Sturges, until May, 1874.

J. Pierpont Morgan, Louis Von Hoffman and John Newell, until May, 1875.

The officers, re-elected, are: John Newell, Chicago, President; William H. Osborn, New York, Vice-President; L. A. Catlin, New York, Secretary; and William K. Ackerman, Chicago, Treasurer.

Base Ball.

The many railroad officers of the city, who last season devoted some precious moments to this pastime, were summoned to meet again this week. The exploits of the "Fearfuls" and "Wonderfuls," last year, are to be repeated.

Chicago, Danville & Vincennes.

Mr. Alexander Taylor, who has the contract for grading this road, thinks he will have the grading ready to lay the iron as far south as Milford—about 8 miles south of the Toledo, Wabash & Western crossing—in about three weeks. He also expects to reach Rossville—20 miles north of Danville—by the 4th of July.

Chicago & Northwestern.

The annual stockholders' meeting was held at the company's offices in this city on Thursday of this week (the 1st inst.) and the following Directors were elected to take the places of the five who retire this year under the new classification: Messrs. John F. Tracy, A. B. Baylis, David Dows, Geo. L. Dunlap and Francis H. Tows. These are all re-elections, with the exception of Messrs. Dows and Tows, both of whom are members of the Rock Island Directory. Messrs. H. H. Baxter and H. R. Pierson retire.

The board now stands: G. S. Scott, H. Kennedy, of New York; L. Ten Have, Frzn., Amsterdam; W. L. Scott, M. Courtwright, Erie, Pa.; John B. Turner [deceased] Chicago, until June 1873.

J. M. Burke, A. G. Dulman, M. L. Sykes, C. R. Marvin, New York; R. P. Flower, Watertown, N. Y.; H. H. Porter, Chicago, until June, 1873.

John F. Tracy, Chicago; A. B. Baylis, David Dows, New York; Geo. L. Dunlap, Chicago, and Francis H. Tows, New York, until June, 1874. Eight of these are members of the Rock Island directory.

OLD AND NEW ROADS.

Queen Anne's & Kent.

The Maryland *Republican* says that Capt. Robert Irwin, Sons & Co., who are the contractors for building the Queen Anne's & Kent County Railroad, a distance of twenty-six miles from Massey's Cross Roads southwest to Centerville, have nearly completed their work. The road is now all graded, and some twenty-two miles of track laid, with cars running regularly on it. They expect to finish the work about the middle of June, after which efforts will probably be made looking to an extension of it six miles farther to tide-water at Queens-town.

Cincinnati & Springfield.

The contract for the earthwork for the section of this road between Cincinnati and Middletown was let to Snell, Denton & Co. (not Grill, Taylor & Co., as the

telegraph had it last week). Mr. Snell of this firm, is Col. Thomas Snell, of Snell, Taylor & Co., Chicago; and Mr. Denton has lately executed a contract for 25 miles of grading from Dubuque northward.

We take a corrected account of the letting of the contracts from the Cincinnati *Railroad Record*. The company is to use the track of the Baltimore & Cincinnati Company between Cincinnati and Spring Grove:

"The contract for the earthwork on the first division lying between Spring Grove and Middletown, a distance of 24 miles, was awarded to Snell, Denton & Co.; masonry, to Bates & Bates.

"In the second division—Middletown to Dayton—24 miles—the contract for the earthwork was awarded to Wm. B. Chamberlain, of Hannibal, Mo.; masonry to James Hamilton & Bro., of Piqua, Ohio.

"The work of bricklaying falls to the lot of Wm. B. Chamberlain.

"The contracts for constructing the bridges have not been made, the bids being so nearly alike that it has been difficult to reach a conclusion. The track will be laid with steel rails from the Cleveland rolling mills.

"Work is to be commenced within fifteen days, and the road is to be ready for the rails by the 1st of February, and to be completed for the cars on the 1st day of April next."

The *Record* adds: "As additional news, it may be stated that of late extensive purchases of real estate in the city have been made by the new company, amounting in the aggregate to \$384,500. The lands bounded by Fifth and Front and Indianapolis, Cincinnati & Lafayette Railway track, with the exception of that part occupied by Ross, Pettibone & Co., have been purchased for a lumber depot, making 175 feet front on Fifth street. On the south side of Third street, between Wood and Mill streets, and extending to the Indianapolis, Cincinnati & Lafayette Railroad track, the larger part of the property has been secured; also the greater part of the real estate lying between the track and Front street, and Wood and Ramsey streets, is to be used for freight houses, etc.

"The passenger depot will be the present Plum street depot, which will be occupied jointly by the Indianapolis, Cincinnati & Lafayette, Marietta & Cincinnati, and the Springfield & Cincinnati railroad companies."

East St. Louis Stock Yards.

The superintendent of construction of these yards advertises for proposals for the paving of 120,000 square yards with rubble stone, six inches thick, on a bed of coarse sand not less than six inches thick. Bids will be received until noon June 10.

New Orleans, Mobile & Texas.

This company, which has recently completed its line from New Orleans to Donaldsonville, is now offering first mortgage bonds to the amount of \$12,500 per mile, and second mortgage bonds to an equal amount, on the 220½ miles of road from New Orleans to the Sabine River. These bonds bear 8 per cent. currency interest, payable in New York, or 7 per cent. gold, payable in London, at the option of the holder at the time the coupon is due. They are offered at present at 90.

Iowa Pacific.

Subscription books were opened in Dubuque on the 31st ult., and in a few hours \$160,000 was subscribed.

Detroit & Bay City.

A company has been organized to construct a narrow-gauge railroad from Detroit to Bay City.

Midland Pacific.

This company offers to construct a branch from some point on its line between Nebraska City and Lincoln in a southwesterly direction to Beatrice, if Gage County (of which Beatrice is the county seat) will aid by the subscription of \$350,000 of its bonds.

Springfield & Northwestern.

According to the Fulton County papers, the contracts have been let for the extension of this road from Havana northward to Lewistown, eight miles, to be completed this season, and an effort is to be made to extend the line through Knox County in 1872.

Rockford, Rock Island & St. Louis.

By the time table which went into effect May 21, there is one express train daily running between East St. Louis and Rock Island, one accommodation (the Quincy accommodation) between East St. Louis and Beardstown, and two freights between East St. Louis and Sterling. The express leaves East St. Louis at 9:00 p. m. and arrives at Sterling at 11 a. m., leaves Sterling at 3:10 p. m. and reaches East St. Louis at 6:38 a. m.

Morris Canal & Banking Company.

This company's canal extends from Phillipsburg, N. J., opposite Easton, Pa., eastward across the State of New Jersey to Jersey City, a distance of 102 miles. From the report for the year ending February 28, 1871, we take the following:

The receipts during the year were:

From tolls.....	\$965,565 77
" rents.....	16,690 68
" water rents.....	2,476 00
" other sources.....	2,797 31
Total.....	\$991,549 76

And the disbursements were:

Repairs of canal and works.....	\$125,657 85
Operating canal.....	57,378 82
Salaries, law and other expenses.....	21,065 34
Transportation expenses.....	4,481 40
Total.....	208,473 41

Balance—profits of the business.....\$13,076 35
Balance at credit February 28, 1870.....63,226 36

Total.....\$244,302 71

Compared with the previous year, the gross income shows a decrease of \$39,696 04; with a decrease in expenses of \$37,923 68—making the decrease in net income, \$1,772 36.

Ft. Wayne, Muncie & Cincinnati.

This company is to have an excursion party, chiefly of members of the press, from southern cities particu-

larly, which will pass over its road, and also the Fort Wayne, Jackson & Saginaw to Saginaw Bay. It will reach Fort Wayne Tuesday evening, June 6, remain there over night, and go thence northward.

Leavenworth, Lawrence & Galveston.

The annual meeting of the stockholders for the election of thirteen directors will be held in Lawrence, Kan., on the 5th inst.

The Cherokee Neutral Lands.

These lands had much to do with the construction of the Missouri River, Fort Scott & Gulf Railroad, having been purchased by capitalists who also furnished most of the means for the construction of the road, which has very largely increased the value of the lands. On the latter were many squatters, who held that their claims were good, and that the sale was illegal. On the 27th ult., at Topeka, Kan., the United States Circuit Court decided, in the ejectment suit of Joy against the settlers on the lands:

1. That the treaty of 1835 and Patent Office warrant of 1838 gave a fee simple title to the Cherokee Indians of the neutral lands.

2. That whether the Indians hold the fee or only the ordinary possessory right, the treaties of 1866 and 1868 gave full title to the purchaser under the provisions, as such was plainly the extent of the treaty-making power.

3. That the treaty-making power had full authority to alienate the public domain, and titles so acquired were perfect and indefeasible.

4. That to say the government would sell this land for nearly \$1,000,000, pay the money to the Indians, and then say the purchaser had no title, would be to make the government a party to an enormous fraud.

5. That whether the sale to Mr. Joy was regular or not, under the treaty of 1866, the treaty of 1868 covers all defects, and made the title perfect.

6. That under all the facts and circumstances, the title of J. P. Joy to the lands in question is, under the treaties and patent, a complete and perfect title, and cannot be successfully assailed. The demurrer to the answer is sustained.

Memphis & Ohio.

This company has notified the Comptroller of the State of Tennessee that it is ready to retire its indebtedness to the State, amounting to about two and a half millions in Tennessee State bonds. It is reported and believed in Nashville that the Memphis & Charleston Railroad has bought enough Tennessee bonds to clear it of indebtedness to the State, which was \$1,984,000 according to the Comptroller's published report.

St. Genevieve to Lebanon.

This Missouri road is to be built as an eastern extension of the Laclede & Fort Scott Railroad, and it is reported that Mr. F. A. Rozier, Financial Agent of the extension, has made a contract with representatives of the Pennsylvania, Baltimore & Ohio and Ohio & Mississippi companies for its construction and equipment.

Madisonville & Shawneetown.

Mr. R. J. Laughlin, contractor, announces that he will be able to complete the grading from Madisonville, Kentucky, west to Providence, 16 miles, by the 5th of July next—the time allowed by the company to finish the work.

Omaha & Northwestern.

Mr. J. E. House, the Chief Engineer, has commenced a survey for an extension of the road northward from Blair. It is reported that the company will commence the construction of 50 miles more the present season.

Portsmouth, Great Falls & Conway.

The Boston *Advertiser* says this company "is taking measures to extend its track from West Ossipee to Conway, and work will soon be begun on that part of the line. The northern terminus of this road is at Gorham, connecting with the Grand Trunk in that town. The road passes close to the Glen House, and that property, it is estimated, would be enhanced in value \$50,000 by the opening of this route from the mountains to the beaches. When the road is completed, passengers can make a round trip from Boston to the mountains by way of the Boston, Concord & Montreal Railway, and return by this route, all the way by rail, except the descent from Tip Top, Mount Washington, to Glen House."

Atlantic & Pacific.

The track is laid nine miles into the Indian Territory, to Grand River, and on the 25th ult. the first passenger train, with an excursion party from Springfield, ran through to the river. The piers for the bridge are nearly finished, and grading is in progress for twenty miles beyond. The bridge will have four spans of 150 feet each. Near this point the road will cross the line of the Missouri, Kansas & Texas road.

The Missouri Construction Company has taken the contract to build the branch to Baxter Springs, and is to complete the work within the next two months.

Richmond & Atlanta Air Line.

A correspondent writes from Greenville, S. C., that Gower & Mills have commenced work on their contract for grading the second division of this road, and have about one hundred hands at work. The engineers are now locating the line westward toward Gainesville, Ga., the terminus of the Western Division, and the whole road is to be completed by the close of the year 1872.

Lafayette & Chicago.

The company which has lately been organized to construct a railroad from Lafayette northwestward to a junction with the Chicago & Danville road, have let contracts, and work is soon to be commenced.

St. Louis & Southeastern.

It is intended to have the extension of this road completed from the present eastern terminus southeast to McLeansboro, 27 miles, by the 1st of September. Mean-

while work will be progressing from Evansville eastward, and it is expected that the line will be complete from St. Louis to Evansville by the 1st of November. The laying of the masonry on the bridge over the Wabash has been commenced, and a large amount of stone is on hand.

West Wisconsin.

Sufficient iron has arrived for the extension of this road from its present terminus at Menominee westward to Summit Station, ten miles, and it will be laid immediately.

Lafayette, Muncie & Bloomington.

Snell & Taylor, who have the contract for the construction of the entire line, are letting sub-contracts, and work is commenced.

Chicago & Michigan Lake Shore.

This road, which is in operation from New Buffalo to Breedsville, where it crosses the Kalamazoo Division of the Michigan Central, was to have been opened to Holland, thirty miles further north, this week.

Iowa Pacific.

The directors met at Dubuque on the 22d ult., and the contract between the Iowa Pacific and Chicago, Dubuque & Minnesota railroad companies was signed, the provisions of which give the former the right to use the track of the latter company over a certain defined extent of its road. Messrs. J. K. Graves and H. L. Stout were chosen directors of the Iowa Pacific Company, and the time for the annual meeting of the stockholders announced to be held on the first Monday in June next, at which meeting the company will reorganize.

Memphis & Little Rock.

A traveler who has recently passed over this road on his way to the Hot Springs describes its condition as follows, in a letter to the *Chicago Tribune*:

"The railroad from Memphis to Little Rock, on which trains recently commenced running, shortens the journey to the Springs about two days, but the ride is attended with much danger and mental anxiety, as the risk of being buried in a swamp, through which the road runs, is very great. This road has been fifteen years constructing, and the rails never would have been laid had not several enterprising gentlemen of Memphis obtained control of it. The building of a railway through such a country as that between the Mississippi and White rivers was considered a foolhardy undertaking, the major part of the land being covered with water; but there was money in it, and those having charge were not to be intimidated by swamps and other natural disadvantages. The road is yet far from completion, but men are at work on it, and in a year or two it will be as good a railroad as can be found anywhere. Forty miles of it are through a bottom, the rails being for long distances set on trestlework several feet above high water mark. It is the intention, ultimately, to fill in between the piling and make a solid road-bed. The lower portion of the track, from the Mississippi to Conway, was under water during all of March and the greater portion of April, the first through train having passed over it on the 26th of the latter month. You can imagine from this the condition of the road-bed. Heavy and continued rains had materially damaged the foundations as far as Duval's Bluff, and the motion of the cars in passing over the track was not unlike that of a ship in a moderate gale. The bridge over the Cache River was very defective, the piling having been washed out of position and the rails thrown out of line. While crossing it at a snail's pace every one in the cars anticipated a ducking, but, fortunately, we passed over safely. We reached Little Rock on time, having been nearly twelve hours 'crawling' one hundred and thirty miles."

Peninsular of Michigan.

The stockholders of the Michigan Midland Railroad Company met in St. Clair, on the 23d ult., and approved of the consolidation of their company with the Peninsular Railway Company. The latter name will be that of the new company. The directors of the consolidated company will meet at Battle Creek on the 21st of June to elect new officers.

The laying of iron between Climax and Schoolcraft was finished last week. Between Schoolcraft and Cassopolis the iron was already laid, so that the company now has 98 miles of road, from Cassopolis to Lansing.

Alabama & Chattanooga.

Messrs. Buckley, Welling & Co., who have overdue claims on this company amounting to about \$25,000 secured by second mortgage bonds, have instituted proceedings in bankruptcy against it. Many other creditors, including the Jackson & Sharp Car Company, of Wilmington, have expressed their belief that the present embarrassments of the company will prove temporary, and that their best prospect for payment will be under the present management of the property.

Manchester & Keene.

A company has been organized to construct a railroad from Manchester, N. H., nearly due west to Keene, on a line about 18 miles north of the Massachusetts line. An attempt will be made to interest the Boston & Lowell and Lowell & Nashua in the construction of the road.

European & North American.

In an account of an excursion to the terminus a correspondent of the *Portland Argus* says:

"While at Mattawamkeag, which is 58 miles from Bangor, the party surveyed the substantial truss bridge across the river. The rails are not laid over it as yet, but the road-bed is ready to 'the deep cut' and beyond, so that the rails can be laid to the State line. It is now promised that this easy running and very straight road will be completed to its connection with the Dominion Division by the last of August or first of September. Then Portland, by a belt of iron 342 miles long, will have railroad connection with the city of St.

John, N. S. There are but 52 miles now of rail to be laid; the financial condition of the line is excellent, we are assured, and its prospects very great. By this first-class road the trip to Europe will be shortened at least two days, and from the traffic that will grow out of that the company expect a large revenue."

Missouri River, Fort Scott & Gulf.

Two new sleeping cars, with all the latest improvements, have just been built for the company at the Aurora, Ill., shops, under the supervision of Mr. W. W. Wilcox. The purchasing agent of the company writes us that 14,000 head of cattle in excellent condition—most of them beef cattle—are awaiting shipment at Baxter Springs. The condition of the road-bed has been frequently referred to in these columns and is probably one of the most perfect of Western roads.

Georgia Railroad.

Certain stockholders of this company make the following protest against pledging the property of their company as security for the association which has rented the Western & Atlantic Railroad, some of whose members are also stockholders in the Georgia Company:

"The undersigned, stockholders in said company, do hereby protest against the action of the directors in pledging said company as security for the persons of the so-called company who are holding the recent lease of the Western & Atlantic Railroad for a term of twenty years, thereby denying the right and power of any number of stockholders, to bind other stockholders, or to bind the Georgia Railroad Company, as a company, on said contract of securityship, and declaring our intention that neither we, as stockholders, nor the company as a company, shall be held bound thereby in any respect nor to any extent, however small or limited. We further declare that if the act of the so-called Legislature providing for the lease of the Southwestern & Atlantic Railroad shall be construed as such an enlargement of the charter of the Georgia Railroad and Banking Company as would authorize said contract of securityship, then we protest against said enlargement, and refuse to accept the same, believing as we do that said contract of securityship is entirely outside of the charter and scope of the Georgia Railroad and Banking Company, and that the charter cannot be enlarged so as to embark the company into a new business or involve them in liabilities outside the charter without the unanimous consent of all the stockholders."

Pacific of Missouri.

The *St. Louis Republican* of the 31st ult. says, reporting the return of Captain Brown, Mayor of the city, and President of this railroad, from the East, where he had been to negotiate bonds of the city and of the company:

"The Pacific Railroad bonds, for the sale of which Captain Brown made arrangement, are \$3,000,000 six per cent. gold second mortgage bonds. The proceeds will be used in part to build a branch of the Pacific road, commencing at a point about 9 miles from the city, and running to Carondelet, following as nearly as possible the River des Peres. The estimated cost of this is \$300,000. The main object is to form a direct connection with the iron furnaces. The proceeds will also be used to construct 15 miles of double track from St. Louis to Kirkwood and take up the \$1,000,000 floating debt. He also left in the hands of the company's agent bonds to the amount of \$90,000 of the Lexington & St. Louis Railroad. The proceeds will be applied to paying for the iron furnished the road, which is a branch of the Pacific running from Lexington to Sedalia. The bonds will be realized upon within the next 30 days. The road will, it is expected, be finished by the end of September."

Alabama & Chattanooga.

The statement of the route by which trains are to run between New Orleans and Chattanooga given in the *GAZETTE* of May 20, was based on erroneous information. A correspondent in New Orleans informs us that the trains will not run *via* Jackson, Miss., to Meridian, but *via* Mobile, passing over the New Orleans, Mobile & Texas Railroad from New Orleans to Mobile, and over the Mobile & Ohio from Mobile to Meridian. Our correspondent gives the following corrected table of distances:

New Orleans to Mobile	140 miles.
Mobile " Meridian	135 "
Meridian " Chattanooga	95 "
Chattanooga " Lynchburg	446 "
Lynchburg " Washington	178 "
Washington " New York	228 "
Total distance	1,422 miles.

Pullman palace cars began to run through to Chattanooga *via* this line from New Orleans June 1, and will run from New Orleans to Lynchburg after July 1, making but one change of cars to New York.

Vermont & Canada.

At a meeting of the stockholders, held at St. Albans on the 16th ult., it was voted to issue additional stock to the amount of \$500,000 to stockholders of record of that date *pro rata* at par; provided they shall signify their option to take the same by the first day of June proximo, and pay for the same on or before the first day of July next, with interest at the rate of 8 per cent. per annum after the first day of June. Stockholders desiring to avail themselves of the opportunity to take said stock will signify it in writing to the Treasurer, John W. Newton, St. Albans, or Edward Blake, Esq., No. 10 Railroad Exchange, Boston, before the first day of June. The stock heretofore has been \$2,500,000. The road is leased and operated by the Vermont Central.

Northern of New Hampshire.

The report of this company, submitted at the stockholders' annual meeting, held last week at Concord, shows that the gross income of the road, including interest, during the past year, to be \$1,963,440; expendi-

tures, \$887,567; leaving a net income of \$185,773. This is \$76,024 less than last year, owing to the great increase of expenditures, amounting to some \$101,108. Of this there has been paid for a new bridge across the Connecticut River at West Lebanon, \$21,642; for land and improvements at same place, \$14,640; excess of new rails and sleepers over last year, \$40,708; increase of full expense, \$17,716; repairs of locomotive at the Canaan accident, \$8,400. A new passenger locomotive, thirteen merchandise and twenty-one gravel cars, besides rebuilding several old ones, have been added. The directors declare 8 per cent. dividend, the necessary addition to net income required for the same being taken from the reserved funds. The Sugar River road will be opened to Newport this fall, and perhaps to Claremont Village during the year. The cause of the Canaan accident is said to have been the failure of one of the conductors to observe carefully the rules and regulations of the road. The expenses of the road occasioned by the contract with the Concord Railroad are larger than previously, the law expenses being \$10,046, against \$450 last year.

Wisconsin Central.

Grading is in progress all along the line from Menasha to Stevens' Point, and a number of sections of it are entirely completed. The grade of this portion will be so far completed by the 1st of July that track-laying will begin and proceed without interruption. The engineering party for locating the fifty miles beyond Stevens' Point is still in the field, but is expected to report so that bids for grading may be advertised for as soon as the 1st of July.

Oshkosh & Mississippi.

The Oshkosh (Wis.) *Northwestern* says: "Whalen & McGee, of LaCrosse, have filed with the Oshkosh & Mississippi River Railroad Company, a bond for the faithful performance of their contract, and have commenced work in grading the line of the road between Oshkosh and Ripon. The contract binds them to complete the work on or before the 15th day of August next. There is now no doubt that the road will be ironed and in working order early this fall."

Cedar Rapids & St. Louis.

The company is now condemning the right of way which they could not secure otherwise, between Ottumwa & Sigourney, and grading is to be begun very soon.

Flint & Pere Marquette.

Mr. Pratt, one of the contractors of the Flint & Pere Marquette Railroad, informs the Flint (Mich.) *Globe* that the iron is laid to a point just 69 miles from Saginaw, and within a few feet of the west line of Clare and the east line of Osceola County. Mr. Pratt's contract covers a line of 20 miles, the western limit of which is a point within 13 miles of Hersey, the junction with the Grand Rapids & Indiana Railroad. This 13 miles is under contract, and will be completed ready for use by the 1st of October, by which time Mr. Pratt's job will be done. Trains will then run to the junction.

Southern Minnesota.

The Winona (Minn.) *Republican* of May 26 says: "There is a rumor afloat, which appears to be well founded, that the Southern Minnesota Railroad is about to change owners. Into whose hands it is to fall—whether those of the Northwestern Company or the Milwaukee & St. Paul Company—has not yet transpired. Both of these powerful corporations have recently been making efforts to secure possession or control of the road in question, the finances of which, it is understood, are in a very straitened condition, necessitating prompt negotiations of some kind on the part of those who have hitherto managed it."

Atlantic, Mississippi & Ohio.

The stockholders in the consolidated corporation met at Lynchburg on the 18th ult. Gen. Wm. Mahone, President, submitted his annual report. Among other matters the following facts were exhibited. The year before the war the roads from Norfolk to Bristol, operating under separate organizations, earned \$1,241,862.01, and for the year following the close of the war, \$1,054,258.10; while for the year ending September 30th, 1870, the figure was \$1,925,686.51—showing an increase since the war of \$871,524.40, or 83 per cent. The net earnings were in round numbers \$756,000, after allowing for discount on moneys borrowed, \$107,000. This item will not appear in the future, giving a net income of \$863,000, which would pay the interest at seven per cent. on about \$12,000,000 bonds. The business committee subsequently submitted their report, which was adopted, and among other things empowered the President and directors to execute a mortgage on the company's property, not exceeding \$15,000,000; recommended that the company conduct an express business over its roads, and appointed a committee to go to Louisville and arrange to connect with the Louisville & Nashville Railroad. The old board of officers were re-elected.—*Baltimore Sun*.

Augusta & Hartwell.

This is a line which it is proposed to construct from Augusta, Ga., in a northwesterly direction along or near the Georgia side of the Savannah River to a connection with the Blue Ridge Railroad near the northeast corner of Georgia, about 125 miles. The Chief Engineer has recently surveyed two routes for the line between Augusta and the Broad River. One of these, a few miles from the river, gives a line to Hartwell Mills, on Broad River, 60.6 miles long, with maximum grades of 80 and average grades of 53.3 feet per mile, at an estimated cost of \$30,075 per mile. The other line, running for the most part close along the Savannah, would be 53.6 miles long, with maximum grades of 52.8 and average grades of 19.3 feet per mile, at an estimated cost of \$23,294 per mile, in both cases exclusive of equipment and depots. From the Broad River it is proposed to follow the divide between the Broad and the Savannah for 65 miles, to a point

near the northern boundary of Franklin County, with moderate grades, and thence for 33 miles there is some very difficult work. If it should prove too costly, it is proposed to diverge to the right and make a connection with the Blue Ridge Railroad at Walhalla, S. C.

Cairo & Vincennes.

A public meeting was held in Cairo on the morning of the 31st ult. at which resolutions were passed earnestly requesting the County Court not to withhold the county's donation of \$10,000, which it is said, will enable the company to resume the work immediately.

Quincy, Alton & St. Louis.

Arrangements have been made to have this road graded to a point on the Toledo, Wabash & Western Railroad within the next sixty days. Iron for thirty-one miles has already arrived.

TRAFFIC AND EARNINGS.

—The traffic receipts of the Great Western of Canada for the week ending May 5 amounted to £16,523, against £17,727 in the corresponding week of last year, showing a decrease of £1,199.

—The Union Pacific Railroad Company has published the following statement of earnings and operating expenses for April, 1871; from January 1, 1871, to May 1; and since the opening of the road May 10, 1869:

	April, 1871.	April, 1870.
Earnings.....	\$604,947 58	\$690,973 26
Expenses.....	268,401 94	474,355 61
Net earnings.....	\$336,545 64	\$216,617 65
	1st Jan. to 30th April, '71.	1st Jan. to 30th April, '70.
Earnings.....	\$1,937,641 23	\$2,148,879 99
Expenses.....	1,022,414 69	1,841,045 27
Net earnings.....	\$915,226 54	\$307,834 72

The net earnings of 1871 show an increase over 1870: For April.....\$129,227 99
3 months previous.....358,166 83

And for 4 months.....\$487,394 82
Comparative statement since opening, 10th May, 1869:

	1st Fiscal Year 10th May, '69 - 30th April, '70	Calendar Year, '70.	2d Fiscal Year 1st May, '70 - 30th April, '71
Earnings.....	\$8,364,592 50	\$7,625,277 11	\$7,333,961 35
Expenses.....	5,797,098 56	4,677,414 84	5,898,704 26
Net earnings.....	\$2,567,493 94	\$2,947,862 27	\$1,435,257 09
Percentage of ex- penses.....	69 30-100	61 34-100	51 16-100

—The traffic receipts of the Grand Trunk of Canada for the week ending May 6 amounted to £32,100, against £33,300 in the corresponding week of last year, showing a decrease of £1,200.

ELECTIONS AND APPOINTMENTS.

—The incorporators of the New York Viaduct Railroad met last week and chose the following Board of Directors: Alexander T. Stewart, William M. Tweed, August Belmont, Charles A. Lamont, James F. D. Lanier, Franklin A. Osgood, William Butler Duncan, John J. Bradley, Charles L. Tiffany, William R. Travers, John Q. Jones, Richard B. Connolly, A. Oakley Hall, John Jacob Astor, Peter B. Sweeney, Levi P. Morton, Hugh Smith, William T. Blodgett, Richard O'Gorman, Jose F. Navarro, Henry Smith, Edward B. Wesley, Wilson G. Hunt, John Taylor Johnson, Henry Hilton.

—It is reported that Mr. E. L. Wentz has resigned the superintendency of the Cincinnati & Indianapolis Junction Railroad, to which he was only a short time ago appointed, and that Mr. J. C. Sheldon is his successor.

—Mr. L. A. Emerson, on the 24th ult., assumed the duties of General Passenger Agent and Auditor of the Sheboygan & Fond du Lac Railroad Company, in place Mr. T. F. Strong, Jr., late Passenger Agent, and Mr. L. S. Hough, the former Auditor.

—At the recent annual meeting of the projected Windsor & Forest Line Railroad, at Marlow, N. H., a full board of directors was elected, with T. H. Woods of Nashua as President, O. F. R. Waite, of Claremont, Clerk, and V. C. Gilman, of Nashua, Treasurer. The President was authorized to arrange for surveys and location as well as the construction of said road by any corporation willing to undertake it.

—The Plymouth & Sandwich (Mass.) Railroad Company has been organized by the election of a board of directors with Albert Mason, of Plymouth, President; B. A. Hathaway, Clerk, and Wm. H. Nelson, Treasurer.

—The Hanover (Pa.) Branch Railroad Company has re-elected Captain A. W. Eichelberger President, and Henry Wirt, Reuben Young, Joseph Dellone, Henry C. Schriver, Jacob Forrest and David M. Myers, as Directors.

—B. H. Kidder, before the war Master of the Round House of the Chicago, Burlington & Quincy Railroad, in Aurora, and later Master Mechanic at Adrian, Mich., has been promoted to the position of Master Mechanic of the Buffalo Division of the Lake Shore & Michigan Southern Railway.

—W. C. Graham has been appointed agent of the Missouri, Kansas & Texas Railroad in St. Louis, and has opened an office at No. 203 Pine street.

—The following gentlemen have been elected directors of the New York & New Haven Railroad Company for the ensuing year: William D. Bishop, Bridgeport; George B. Carhart, George N. Miller, Abraham Van Nest, Wilson G. Hunt, New York; Ezekiel H. Trowbridge, New Haven; Jonathan Godfrey, Southport; Nathan A. Baldwin, Milford; Nathaniel Wheeler, Bridgeport; Horatio F. Clark, New York. The two last named are new members, taking the places of James J. Roosevelt, of New York, and William W. Boardman, of New Haven.

—The directors of the Cairo & Fulton Railroad Company have elected the following officers: M. L. Rice, President; J. L. Hodges, Secretary and Treasurer; P. K. Roots, Chief Engineer; Geo. R. Weeks, Land Agent; Henry Page, Superintendent.

—Col. Hans Matson has resigned his office as Secretary of State of Minnesota, and gone to Sweden as Immigration Agent of the Lake Superior & Mississippi Railroad.

—At the annual meeting of the Manchester & Keene Railroad Corporation, at Keene, N. H., on the 17th ult., the following gentlemen were elected Directors: Henry Colony, Samuel W. Hale, George B. Twitchell, James A. Richardson, Milan Harris, Archibald H. Dunlap, Theodore A. Wood. Henry Colony was chosen President, and Thomas E. Hatch, Clerk.

—The recent election of directors of the Atlantic & Pacific Railroad Company, held at Boston, resulted in the election of the following board for the ensuing year: Francis B. Hayes, Boston, President; Uriel Crocker, Boston, Vice-President; Andrew Pierce, St. Louis, Managing Director; Isaac Rich, Jacob Sleeper, George S. Curtis, Charles G. Morrill and Oliver Ames, Boston; Joseph Seligman, A. B. Stout and W. H. Coffin, of New York; Frederick Billings, Woodstock, Vt.; Osias Bailey, White Cloud, Kan. These gentlemen, with the exception of Mr. Billings, comprised the old board. Mr. W. A. Hayes, of Boston, was elected Secretary and Treasurer. Only one of these directors, Andrew Pierce, Jr., is in the Missouri Pacific directory.

—The directors of the Mexico & Monroe City Railroad Company—from Mexico, on the North Missouri, north to Monroe City, on the Hannibal & St. Joseph—recently elected the following officers: President, C. H. Hardin, of Mexico; Vice-President, P. R. Ridgely, of Monroe City; S. E. Cummings, of same place, Secretary; Treasurer, J. E. Dearing, of Mexico; Attorney, J. E. Hutton, of same place. Measures are to be taken at once to have the road surveyed and located. The road will be a branch of the St. Louis & Keokuk road.

—Hon. George Vickers, John Gale, G. W. T. Perkins, Wm. Welch, Jesse K. Hines, Wm. B. Wilmer, Richard C. Johnson and Charles Beaton have been elected directors of the Kent County (Md.) Railroad Company. The officers are: President, Hon. George Vickers; Treasurer, R. Hynson; Secretary, H. W. Vickers; Superintendent, J. K. Hines.

—At a meeting of the grantees of the Manchester & Claremont Railroad, at Manchester, N. H., on the 20th ult., the following Board of Directors was elected: E. A. Straw, Joseph Kidder, James A. Weston, John C. French and S. N. Bell, of Manchester; James F. Briggs, of Hillsboro', and Moses a Hodgdon, of Wear. Frederick Smythe was chosen Treasurer and S. N. Bell was chosen Clerk.

—The late election of directors of the Charlotte, Columbus & Augusta Railroad Company, resulted in the choice of the following: William Johnston, Rufus Baringer, A. B. Davidson, J. Harvey Wilson, of North Carolina; A. B. Springs, York County, S. C.; John J. McLure, Giles J. Patterson, Chester, S. C.; Wm. R. Robertson, James H. Rion, Fairfield County, S. C.; John Fisher, F. W. McMaster, E. Hope, T. J. Robertson, Richland County, S. C.; J. B. Palmer, Lexington, S. C.; Wm. E. Jackson, John J. Cohen, S. D. Heard, Augusta, Ga. Charles S. Estes, the Mayor of Augusta, is *ex officio* a director. William Johnston has been re-elected President and General E. P. Alexander General Superintendent.

MISCELLANEOUS.

—Mr. William J. McAlpine, who is generally recognized as one of the greatest living engineers, left his home at Pittsfield, Mass., this week, for Europe, having been engaged by the Austrian Government to superintend the improvement of the channel of the Danube.

—The Vermont & Massachusetts Railroad was convicted in the Superior Court at Worcester, of killing George A. Johnson, the well-known "pop-corn man," at the Athol accident, last June, the accident having been caused by the carelessness of one of its employees. The defense was that he was an employe of the road, not a passenger, as he carried ice water through the car in part payment for his fare. This point, which was overruled, will be carried up to the Supreme Court. The penalty, if the conviction stands, is not more than \$5,000 nor less than \$500, to be paid to the heirs of the person killed.

—Since the completion of the St. Charles Bridge, the North Missouri Railroad Company advertises that freight delivered at the depot in St. Louis as early as four o'clock p. m. will be delivered in Kansas City by two o'clock p. m. of the next day, in time for shipment that night on connecting roads, making a saving of twenty-four hours to points on the Kansas Pacific.

—Among the cases just decided in the Supreme Court of Illinois was that of the Peoria & Rock Island Railway Company vs. Houston. This is the matter of the Akron subscription of \$30,000 to the capital stock of the Peoria & Rock Island Railroad, and which was resisted by the town on the ground of informality. The decision of the Supreme Court is in favor of the railway company, and the town has now to issue the bonds and pay the sum of \$7,000 back interest.

A New Car Company.

Certificates of incorporation of the Haskell & Barker Car Company, of Michigan City, Indiana, were filed in the office of the Secretary of State last week. The object of the incorporation is the manufacture and sale of railroad cars and all material used in such manufacture. The capital stock is fixed at \$100,000, divided into shares of \$50 each. The term of existence is limited to twenty years.

Haskell & Barker have been manufacturing cars in Michigan City under their firm name for some time past. They have an office in Chicago.